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## A 50-CENT LAKE FREIGHT.

THAT RATE, FREE OF HANDLING CHARGES, TO PREVAIL ON ORE CARRIED BY THE ROCKEFELLER SHIPS FOR THE CARNEGIE COMPANY.

It has been known for some time past that the Rockefeller and Carnegie interests on the great lakes had certain important negotiations under way relative to new mining leases on the Mesabi range and to the transportation of ore for the Carnegie company over the Rockefeller railway in Minnesota (Duluth, Mesabi & Northern) and in vessels of the Bessemer Steamship Co. to Lake Erie. From court records made in Duluth in connection with a lease of the Stephens mine, involved in these negotiations, it would seem that a new form of agreement has been entered into between these two large interests regarding the Stephens ore. The record does not indicate that this new agreement extends to all Mesabi ore used by the Carnegie company.

No statement of an official kind has been given out by either side but if the new agreement covers all Carnegie ore from the Mesabi it is very probably for the long term of fifty years. The court record above referred to gives the lake freight as 50 cents net—that is without the unloading charge—and the rail rate over the Rockefeller road in Minnesota 80 cents, or a total of $1.30 a ton from mines to Lake Erie docks. The newspaper reports about the Bessemer company acquiring the vessels of the Carnegie company are without foundation. The Carnegie company has and will have 3,000,000 tons or more of ore to move aside from that involved in the Rockefeller agreement and will have use for its own vessels, as well as many others. On the other hand it may be well to note also that the amount of ore involved in this agreement is by no means sufficient to provide employment for fifty or more ships now in the Rockefeller or Bessemer fleet. The Bessemer company has other important ore connections, but is still so situated, it would seem, as to be on the side of profitable carrying charges.

A 50 cent rate, free of unloading charges, does not seem very attractive when compared with the boom figure of $1.25 established this year; neither does it seem highly profitable for any one year, but when the rail charge and the term of fifty years are taken into account, it must be considered in quite a different light.

The first of two documents filed with the register of deeds at Duluth in the Stephens mine matter is a lease of that mine from Henry Stephens and A. L. Stephens of Detroit to the Oliver Iron Mining Co. The second is a sale of the ore in the mine by the Lake Superior Consolidated Iron Mines to the Carnegie Steel Co. From this document it appears that there is a sub-lease from the Oliver company to the Consolidated. The lease provides for a royalty of 15 cents per ton on a minimum output of 100,000 tons of ore per year, and the contract for the sale of the ore is at the same rate. The sale contract, however, is provisional on the ore being hauled over the Rockefeller railway, Duluth, Mesabi & Northern, from mine to lake and in the Bessemer Steamship Co.'s vessels from the ore docks to lower lake ports. The rate on the railroad is to be "the open, current public rate for the time being," and the lake rate is 50 cents per ton plus the actual cost paid by the vessel to unload the ore at the dock to which it is destined.

The price of the ore is to be 15 cents per ton, plus all taxes on the land and on the personal property used in mining the ore. It is provided, further, that if, during the life of the contract, there shall be paid for carrying the ore from the Mesabi range to the lower lake ports less than $1.30 per ton, the difference shall be added to the price of the ore. By this provision the Mesabi road is protected from any reduction in the rail rate for hauling ore from the mine to the dock. The lease from the Stephens to the Oliver company is dated June 15, 1899, and the sale contract is dated May 1, 1900.

### BUFFALO-DETROIT PASSENGER SERVICE.

If General Manager Carter of the Detroit & Cleveland Navigation Co. had his way in the matter, it is more than probable that two very large and fast side-wheel passenger steamers, ranking among the finest in the country, would be under construction for service between Detroit and Buffalo. Such a line will certainly be established, and will very probably be controlled by interests now controlling the Detroit & Cleveland and the Cleveland & Buffalo lines, but the project of fine new steamers for this service, talked of several months ago, is not to be entered upon as yet. The matter is talked of now for the reason that the management of the Detroit & Cleveland company is planning some changes to be made in its vessels during the coming winter, with a view to making a trial of service between Buffalo and Detroit next season, before undertaking the construction of vessels specially designed for that trade. It is understood that the plan is to remodel the steamer City of the Straits, now engaged in excursion service between Cleveland and Put-in-Bay, so as to fit her for taking the place of the City of Alpena or City of Mackinaw on the Detroit-Lake Huron line of the D. & C. Co. This would admit of one of the fast Mackinaw vessels being transferred to the new Buffalo line next year. She would make three trips a week.

Owners of the steamer Simon J. Murphy are to be congratulated upon the success of the Detroit Ship Building Co. in turning out for them a very economical freighter. This vessel has made three trips to the head of Lake Superior and return, carrying on the first trip 247,000 bushels of wheat and on each of the other two about 6,900 gross tons of ore. The average fuel consumption, running at a speed of 12 miles, loaded, has been a little less than 180 tons per round trip. She took on 208 tons of lump coal for the first trip, 178 tons of slack for the second and 168 tons of run of mine for the third, a total of 554 tons. Part of this coal was still in the bunkers at the end of the third trip.

## SHIP YARDS FILLING UP.

LAKE CONSOLIDATION ALREADY HOLDS ORDERS FOR EIGHT STEAMERS OF 5000 TO 6000 GROSS TONS CAPACITY, TO COME OUT IN THE SPRING OF 1901.

In addition to four steel vessels of Canadian canal dimensions, building for A. B. Wolvin and others and to be completed about the close of navigation this year, the American Ship Building Co. (consolidated lake yards) now has orders for eight very large steamers, 5,000 to 6,000 gross tons capacity, which are to be ready for the opening of navigation next year. Five of these are involved in the order just placed with the consolidated companies by J. C. Gilchrist of Cleveland; two others are for Capt. John Mitchell of Cleveland and the eighth is for D. C. Whitney of Detroit. The two Mitchell steamers will be built at the Globe works, Cleveland, and the Whitney vessel at Detroit. Of the Gilchrist steamers it is probable that four will be built at Lorain and one at Detroit. The Gilchrist order is an important one, as the vessels are to cost $210,000 each, or a total somewhat in excess of $1,000,000. Mr. Gilchrist, who already controls twenty-one wooden steamers and three tow barges on the lakes, as well as several wooden tow barges sent to the Atlantic coast some time ago, will have capacity next year, with the addition of this steel fleet, for the movement of probably more than 1,500,000 tons of ore. He is, of course, taking some chance in entering so extensively into new vessels without a connection with any of the ore producing interests, but it is understood that a bonding arrangement involved in the construction of the vessels puts the matter of payments in a very satisfactory condition. Prices of material entering into these vessels are said to be about $1.10 to $1.15 per hundred pounds for plates and $1.60 for shapes. The vessels are to have power equal to that of the Clarence Black, but will be much smaller than the Black, carrying about 1,000 tons less. The Black carries 6,000 gross tons. These steamers will carry 5,000 gross tons. It is rather complimentary to the Detroit Ship Building Co. that the Black, a decidedly successful business boat, should be taken as a pattern by several vessel owners. Another Cleveland owner who contemplates building, wants an exact duplicate of the Black. The Gilchrist steamers will be 366 ft. over all, 346 ft. keel, 48 ft. beam and 28 ft. depth of hold. Engines will be triple expansion, 22 in. high pressure cylinder, and there will be two Scotch boilers in each vessel, all fitted with Howden hot draft. The speed will be about 14 miles light and 12 miles loaded.

The Jenks Ship Building Co. of Port Huron will complete shortly the steel steamer Capt. Thomas Wilson and will immediately hurry work on another steamer, to be put down on yard account. This latest vessel is to be of Canadian canal dimensions and similar in hull to the Wilson line steamer Ravenscraig, built at Port Huron last winter, but she will have greater power.

### MICHIPICOTON ORE PROPERTY.

Trade journals of Canada contain enthusiastic accounts of the iron ore development that is being conducted just above Sault. Ste. Marie, Ont., by Francis H. Clergue of Sault water power fame. One of them referring to the first shipment of ore from this new Lake Superior district says:

'The Helen mine is an outcrop lying between characteristic rocks of the Lake Superior iron-bearing region. It is twelve miles from and 640 ft. above the lake at Michipicoton harbor, and the exposed portion of the deposit is about 400 ft. wide and 700 ft. long. In this distance it rises 120 ft. At the foot of the bluff, tunnels have been driven into the bluff 240 ft., reaching the counter rock. At the west end the ore body extends under the lake to its deepest point, 125 ft. below water level. This lake can be drained by a short tunnel. The company estimates that it has 15,000,000 tons in sight by measurements and diamond drill borings, with 200 ft. of ore below the lake level, and when borings were discontinued, the coves were still ore. The full extent of the deposit is therefore unknown. Its width of 400 ft. does not include a strip nearly half as wide of a lower grade of soft hematite, economically valuable only when transportation costs are not great. The company expects to utilize this at its works at Sault Ste. Marie. The Helen mine, being an open quarry on a side hill, with an earth covering varying from nothing to a few feet, will be at first worked cheaply. The company has installed a No. 8 Gates' crusher, capable of breaking at least 5,000 tons per day, and will at once erect a duplicate plant. The crushers will be fed by Lidgerwood cableways from the mine faces. The company has received two 2,200-ton English built ore ships and will install two more at once. It will build four more of 3,000 tons each next year. It is receiving a heavy equipment of locomotives and 50-ton cars."

Probably no passenger vessels in this country are operated with more exactness as to time of arrival than the large side-wheel steamers of the Cleveland & Buffalo Transit Co., conducting a night service between the cities named. In a total of thirty trips recently the City of Erie was ahead of time only 15 minutes and behind time only 7 minutes. These are totals of variance from the schedule. Of course her running time, about 9½ hours, does not require full speed, and any ordinary delay in leaving port may thus be made up, as these ships, unlike railroad trains, have no stops, and the weather that would delay steamers like the Erie and Buffalo would necessarily be very severe. Passenger Agent Herman of the C. & B. line points to this achievement with great pride, as it shows how the steamers may be depended upon as regards railway and other connections.

President James J. Hill of the Great Northern railway is quoted as saying that ultimately his plan is to have eight such steamers as the two for which plans are being made at the yard of the Eastern Ship Building Co., New London, Conn.

### FASTEST CRUISER IN THE WORLD.

The Russian cruiser Variag, built by the Cramps, Philadelphia, is unquestionably the fastest cruiser in the world. In the teeth of an electrical storm, while undergoing a trial for the standardizing of her screws, she made 24.6 knots an hour, and undoubtedly on her trial trip, had not the cylinder head of the port engine blown out, she would have made 25 knots an hour. As it was she exceeded her contract speed of 23 knots without developing full power. She is regarded by all naval experts as a distinct advance in warship possibilities. She is indeed a triumph of American naval architecture and has proved herself to be faster than any of the great racing machines among the ocean liners. The Variag has thirty Niclausse boilers and ninety furnace doors grouped in five fire rooms. The grate surface is 1,575 sq. ft. and the heating surface 622,290 sq. ft., and the four smoke stacks rise 90 ft. above the grate bars. The steam pressure is 250 lbs. Her splendid engines are of the triple expansion type. They were designed by Capt. N. T. Towne, late chief engineer of the United States navy, and have four cylinders; the high pressure is 40 in. in diameter, intermediate 62 in., and each of the low pressure cylinders 68 in.; the length of the stroke is 36 in. and the intended number of revolutions 160 per minute.

The length of the vessel is 416 ft.; beam, 52 ft.; draught, 19 ft. 6 in.; displacement, 6,500 tons; contract speed, 23 knots; horse power, 20,000; radius of action at full speed, 1,000 knots; at 10 knots speed, 3,000 knots; when all bunkers are full (1,290 tons) and at top speed, 1,700 knots; normal coal supply, 770 tons; weight of guns, 440 tons. The only armor protection of the hull is a curved turtle back deck, extending fore and aft. Additional protection is given by coal and by cellulose filled into cofferdams. The conning tower is 6 in. thick, and the smoke stacks, engine room, hatches and ammunition hoists are well protected. Her battery consists of twelve 6-in. rapid-fire rifles, 45 calibres in length; twelve 3-in. rapid-fire guns, 50 calibres in length; six 1⅛-in. barrel Hotchkiss, two Baronowsky and two 1¼-in. Hotchkiss guns, which are so disposed as to give an exceedingly powerful all-round fire.

The steering gear of the Variag is electric and was manufactured by the Electro-Dynamic Co. of No. 224 Ionic street, Philadelphia.

It will be a month before this magnificent vessel can again leave the works of the Cramps, as the accident that occurred on trial was quite serious. It appears that while the Variag was under very high pressure and sailing at 24 knots a cylinder head of the port engine and the flange to which it was attached both cracked, rendering the engine useless. The damage is roughly estimated at $20,000, which was, however, covered by trial insurance.

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It is rumored that William Denny & Bros. of Dumbarton, Scotland, will be the first to adopt the steam turbine for merchant vessel propulsion, and it is stated on good authority that the London, Brighton & South Coast Railway Co., which operates a fine line of steamers between Newhaven and Dieppe, will be the owners of the first steam-turbine-propelled passenger steamer. Be this as it may, it is certain that Mr. Parsons has prepared plans for Messrs. Denny and the L., B. & S. C. Ry. Co., and that officials of both concerns were on board the Viper during her recent speed and maneuvering tests.

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Advices from Washington say that the president and the secretary of the navy have decided to locate at the Pensacola navy yard the immense floating dry dock bought at Havana from the Spanish government.

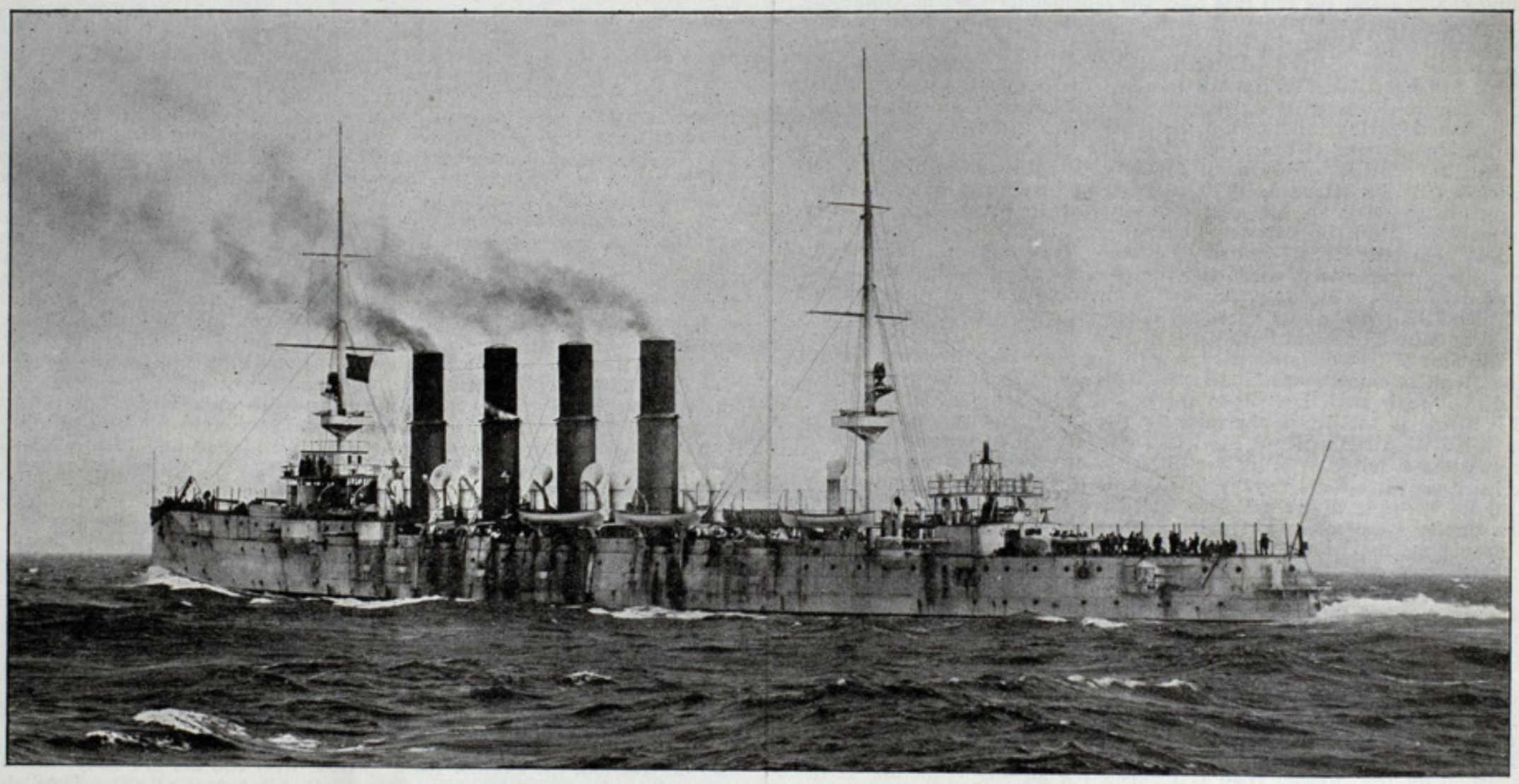
### IMPORTS AND EXPORTS OF IRON AND STEEL.

The following table, compiled from the monthly summary of the bureau of statistics, treasury department, gives the quantities and values of leading articles of iron and steel and iron ore imported into the United States in the fiscal year ending on June 30, 1900; also the quantities of iron and steel and iron ore imported in the fiscal year ending on June 30, 1899.

| Imports, gross tons. Fiscal years. | 1899. Gross tons. | 1900. Gross tons. | 1900. Values. |
|---|---|---|---|
| Pig iron, spiegel, and ferro | 23,316 | 61,100 | $2,109,501 |
| Scrap iron and scrap steel | 4,642 | 28,431 | 562,685 |
| Bar iron | 19,975 | 21,314 | 1,028,877 |
| Iron and steel rails | 624 | 2,487 | 83,738 |
| Hoop, band, or scroll | 9 | 683 | 31,749 |
| Steel ingots, billets, blooms | 10,624 | 14,296 | 1,389,028 |
| Sheet, plate, and taggers' | 1,894 | 10,519 | 668,657 |
| Tinplates | 48,431 | 66,034 | 4,798,170 |
| Wire rods, iron or steel | 15,451 | 21,033 | 1,117,555 |
| Wire and wire rope | 2,356 | 1,807 | 382,690 |
| Anvils | 237 | 259 | 36,420 |
| Chains | 162 | 285 | 43,720 |
| Cutlery, machinery, etc | ..... | ..... | 1,534,348 |
| Total | 127,721 | 228,248 | $13,787,138 |
| Iron ore | 269,013 | 946,194 | $1,497,022 |

The total value of our imports of iron and steel in the fiscal year ending on June 30, 1900, amounted to $20,476,524, against $12,100,440 in the year ending on June 30, 1899, an increase of $8,376,084. The following table gives the quantities and values of our exports of leading articles of iron and steel and iron ore in the fiscal year 1900; also the quantities exported in the fiscal year 1899. The table has been compiled from the same summary of the bureau of statistics.

**Fastest Cruiser in the World on her Sea Trial.**



THE RUSSIAN CRUISER VARIAG, BUILT AT CRAMPS', PHILADELPHIA.

Photo by William H. Rau, Philadelphia. Copyrighted, 1900.

| Exports, gross tons. Fiscal years. | 1899. Gross tons. | 1900. Gross tons. | 1900. Values. |
|---|---|---|---|
| Ferro-manganese | 495 | 16 | $ 2,180 |
| All other pig iron | 299,146 | 160,674 | 3,122,573 |
| Scrap and old | 91,985 | 48,110 | 749,495 |
| Bar iron | 10,520 | 8,240 | 378,120 |
| Band, hoop, or scroll iron | 3,015 | 1,316 | 70,836 |
| Bars, or rods of steel | 32,974 | 32,623 | 1,444,522 |
| Steel wire rods | 25,220 | 11,599 | 513,866 |
| Billets, ingots, and blooms | 43,124 | 14,084 | 440,955 |
| Cut nails and spikes | 14,674 | 11,132 | 647,711 |
| Wire nails | 22,854 | 37,784 | 2,124,522 |
| All other nails, tacks | 2,062 | 1,916 | 2,8,709 |
| Iron plates and sheets | 6,744 | 8,117 | 549,975 |
| Steel plates and sheets | 50,308 | 35,502 | 1,249,576 |
| Tinplates and terne plates | 92 | 143 | 19,062 |
| Structural iron and steel | 49,069 | 56,265 | 2,835,583 |
| Iron rails | 11,776 | 6,149 | 138,304 |
| Steel rails | 266,109 | 341,646 | 9,218,144 |
| Wire | 96,069 | 105,747 | 5,982,400 |
| Locomotive engines | ..... | ..... | 5,592,403 |
| Agricultural implements | ..... | ..... | 16,094,886 |
| Builders' hardware | ..... | ..... | 5,914,489 |
| Saws and tools | ..... | ..... | 3,731,528 |
| Other iron and steel mfs | ..... | ..... | 76,853,385 |
| Total | 1,026,236 | 881,063 | $137,953,230 |
| Iron ore | 31,412 | 40,510 | $79,042 |

The total value of our exports of iron and steel, including agricultural implements, in the fiscal year ending on June 30, 1900, amounted to $137,953,230, against $106,148,228 in the year ending on June 30, 1899, an increase of $31,805,002.

## BIDS FOR ARMOR PLATE REJECTED.

THEY WERE SO COMPLICATED IN THEIR NATURE AS TO MAKE THE ACCEPTANCE OF ANY PORTION IMPOSSIBLE—THE CARNEGIE AND BETHLEHEM COMPANIES HAVE A COMPETITOR.

The controversy between the armor making concerns and the government over the price of armor plate for naval vessels is in a fair way of settlement, though it is not settled yet. This is shown by the character of the bids opened by the navy department last week for furnishing armor for the battleships and protected cruisers authorized by congress in 1899 and 1900. The bids covered armor for seventeen vessels, namely, eight battleships, six armored cruisers and three protected cruisers, and the total amount of armor required is 35,950 tons, with 470 tons of bolts and nuts to affix it in place on the ships. There was a gratifying decrease in the amount of the proposals from the prices fixed when the previous attempt was made to get armor of the kind face hardened by the Krupp process. Then the armor companies insisted on $545 a ton, while to-day two American armor-making firms, the Carnegie and Bethlehem companies, each agree to furnish 15.000 tons of heavy Krupp armor at $490 per ton, with the royalty paid by them, or $445 a ton without the royalty. A new competitor in the armor making field, the Midvale Steel Co., submitted a proposal to furnish 31,000 tons of heavy Krupp armor, the total amount required of that class, at $438 a ton without any charge for royalty, but the delivery of the first armor was not to take place until twenty-six months after the date of the contract, the long period being required presumably by the Midvale company to construct an armor making plant. The Carnegie and Bethlehem companies proposed to take contracts for not less than 15,000 tons each of heavy armor and not less than 18,250 tons each of all classes of armor. The navy department considered the complicated natures of the bids for a few days and then decided to reject them all. There was expressed a desire at first to accept the Midvale bids, if an arrangement could be made by which the two other concerns would modify their identical proposals so as to take the contract for furnishing armor for the three ironclads now under construction, for which no armor has been provided, and thus give the Midvale company time to establish a plant capable of turning out plates for the rest of the battleships and armored cruisers authorized, which will not be ready for their protection for a couple of years. The question of price did not figure in the consideration given by the navy department to the bids and the decision to reject was made wholly on the ground of the complicated nature of the proposals.

Advertisements for new bids were issued on Monday and the opening will take place within six weeks. The department readvertises in the hope of securing satisfactory bids for a smaller amount than 18,250 tons from the Carnegie and Bethlehem companies, as it needs armor for the battleships Maine, Ohio and Missouri within six months.

The bid opening was of unusual interest because it was to test the effect on the armor makers of the practical ultimatum delivered to them by congress in the last naval act, that if the secretary of the navy believed the price he was asked to pay for armor was excessive he should, in his discretion, make arrangements for the erection of an armor plant. The act authorized the secretary of the navy to buy the best armor at $445 a ton, but to pay $545 a ton, unless he considered this price excessive, in which event he was to arrange for the manufacture of armor by the government.

The bids were divided into three classes, and each of these was subdivided. Class A included armor for battleships and armored cruisers, improved and face-hardened, of 5 in. or more in thickness, in lots ranging from 31,000 tons, the total amount required, to 2,500 tons, with the requisite quantity of bolts and nuts. Under this class the bids were as follows: Thirty-one thousand tons, Midvale company, $438 a ton, aggregate, $13,578,000. Twenty-five thousand tons, Midvale company, $440 a ton, aggregate $11,000,000. Twenty thousand tons, Midvale company, $442 a ton, aggregate $8,840,000. Fifteen thousand tons, Carnegie and Bethlehem companies, $445 a ton, aggregate $6,675,000; Midvale company, $454 a ton, aggregate $6,910,000. Ten thousand tons, Midvale company, $466 a ton, aggregate $4,660,000. Five hundred tons, Midvale company, $500 a ton, aggregate $2,500,000. Two thousand five hundred tons, Midvale company, $535 a ton, aggregate, $1,325,000. Under this class the Carnegie and Bethlehem companies agreed to begin deliveries in six months and to continue at the rate of 300 tons a month thereafter. To their bid must be added $45 a ton for royalty on the Krupp process of face-hardening armor, bringing the bid of these two companies on 15,000 tons, the only lot proposed to be furnished by them, to $460 a ton on armor hardened by the Krupp process. The Midvale company, however, agreed not to make any charge for royalty. It fixed the time for beginning deliveries at twenty-six months from the date of contract and offered to deliver armor at the rate of 500 tons a month thereafter.

Class B included armor for battleships and armored cruisers, face hardened, of less than five inches in thickness, aggregating 3,800 tons. The bids follow: Carnegie and Bethlehem, $400 a ton, aggregate $1,520,000; charging for royalty $11.20 a ton, or $411.20 for each ton of armor furnished, with the royalty included. The Midvale company did not bid on this class, but did bid on the fifty tons of bolts and nuts included at $327 a ton.

Class C included armor for battleships, armored cruisers and protected cruisers, not face hardened. Only 1,150 tons of this ordinary armor was asked for. The Carnegie and Bethlehem companies each bid (the Midvale company not competing) $400 a ton; aggregate, $460,000, deliveries to be made in six months at the rate of 300 tons a month. The Midvale company bid on the bolts and nuts required with this class. Bids for furnishing bolts and nuts were received also from the Carpenter Steel Co. of Pittsburgh and T. B. Kendall of Washington, D. C.

The three firms that submitted bids on armor each enclosed a letter with its bid containing alternative propositions. The Carnegie and Bethlehem alternative proposals, practically identical, were that if contracts for an aggregate of 18,250 tons of armor, bolts and nuts, under classes A and B were awarded them, they would furnish the required amounts of each article at the price fixed for each without regard to divisions; in other words, they would furnish any part of the armor and any part of the bolts and nuts without change of price, provided the aggregate amount of all three articles was 18,250 tons. The Midvale company agreed to make the price of bolts and nuts $380 in class B, and $327 a ton in class C, provided a contract for an aggregate of 20,000 tons of armor, bolts and nuts was awarded it. The Midvale company also offered to make the armor included in class B, provided it received the award of all the class A armor at the price proposed by it.

In their identical letters the Carnegie and Bethlehem companies said that the conditions laid down by the navy department were not applicable to the production of Krupp armor, and such reasonable modifications of the department's conditions as would be necessary were expected. This refers apparently to the condition of the department that the armor should be inspected in the stages of preparation by naval officers. As the process is secret it is supposed that the armor makers want the inspection system discontinued for certain parts of the period of production.

## SUMMARY OF NAVAL CONSTRUCTION.

The monthly summary of construction, issued by Rear Admiral Hichborn, chief of the bureau of construction and repair, shows the degree of completion on Aug. 1, 1900, of the various craft now being built for the United States navy:

| Name of Vessel. | Speed. | Built by | Degree of Completion. |
|---|---|---|---|
| **BATTLESHIPS.** | | | |
| Illinois | 16 knots | Newport News | 84 per cent. |
| Alabama | 16 " | Cramp & Sons | 98 " |
| Wisconsin | 16 " | Union Iron Works | 94 " |
| Maine | 18 " | Cramp & Sons | 32 " |
| Missouri | 18 " | Newport News | 9 " |
| Ohio | 18 " | Union Iron Works | 23 " |
| **SHEATHED PROTECTED CRUISERS.** | | | |
| Denver | 17 knots | Neafie & Levy | 20 per cent. |
| Des Moines | 17 " | Fore River Engine Co. | 4 " |
| Chattanooga | 17 " | Lewis Nixon | 7 " |
| Galveston | 17 " | Wm. R. Trigg Co. | 0 " |
| Tacoma | 17 " | Union Iron Works | 0 " |
| Cleveland | 17 " | Bath Iron Works | 8 " |
| **MONITORS.** | | | |
| Arkansas | 12 knots | Newport News | 34 per cent. |
| Connecticut | 12 " | Bath Iron Works | 60 " |
| Florida | 12 " | Lewis Nixon | 43 " |
| Wyoming | 12 " | Union Iron Works | 48 " |
| **TORPEDO BOAT DESTROYERS** | | | |
| Bainbridge | 29 knots | Neafie & Levy | 71 per cent. |
| Barry | 29 " | Neafie & Levy | 70 " |
| Chauncey | 29 " | Neafie & Levy | 70 " |
| Dale | 28 " | Wm. R. Trigg Co. | 80 " |
| Decatur | 28 " | Wm. R. Trigg Co. | 77 " |
| Hopkins | 29 " | Harlan & Hollingsworth | 63 " |
| Hull | 29 " | Harlan & Hollingsworth | 63 " |
| Lawrence | 30 " | Fore River Engine Co. | 96 " |
| Macdonough | 30 " | Fore River Engine Co. | 94 " |
| Paul Jones | 29 " | Union Iron Works | 75 " |
| Perry | 29 " | Union Iron Works | 75 " |
| Preble | 29 " | Union Iron Works | 75 " |
| Stewart | 29 " | Gas Engine & Power Co. | 31 " |
| Truxton | 30 " | Maryland Steel Co. | 28 " |
| Whipple | 30 " | Maryland Steel Co. | 28 " |
| Worden | 30 " | Maryland Steel Co. | 28 " |
| **TORPEDO BOATS.** | | | |
| Stringham | 30 knots | Harlan & Hollingsworth | 98 per cent. |
| Goldsborough | 30 " | Wolff & Zwicker | 99 " |
| Bailey | 30 " | Gas Engine & Power Co. | 95 " |
| Bagley | 28 " | Bath Iron Works | 73 " |
| Barney | 28 " | Bath Iron Works | 93 " |
| Biddle | 28 " | Bath Iron Works | 53 " |
| Blakely | 26 " | Geo. Lawley & Son | 90 " |
| DeLong | 26 " | Geo. Lawley & Son | 90 " |
| Nicholson | 26 " | Lewis Nixon | 70 " |
| O'Brien | 26 " | Lewis Nixon | 73 " |
| Shubrick | 26 " | Wm. R. Trigg Co. | 89 " |
| Stockton | 26 " | Wm. R. Trigg Co. | 94 " |
| Thornton | 26 " | Wm. R. Trigg Co. | 87 " |
| Tingey | 26 " | Columbian Iron Works | 61 " |
| Wilkes | 26.5 " | Gas Engine & Power Co. | 53 " |
| **SUBMARINE TORPEDO BOAT.** | | | |
| Plunger | 8 knots | Wm. R. Trigg Co. | 85 per cent. |

## CRAMPS EMPLOYING ABOUT 8000 MEN.

The ship yard of the Cramps at Philadelphia presents a busy appearance, ten merchant steamers, three battleships and a cruiser being under various stages of construction and rapid progress is being made to their completion. First of all, the battleship Alabama is receiving the finishing touches for her official trial, which will take place this month. The Russian cruiser Variag is about completed and the time is approaching for the launching of the Russian battleship Retvizan, which will be a wonder. The plating of the battleship Maine is well on and her launching will be a national event. She is built to replace the Maine, blown up in Havana, Cuba. The steamship Morro Castle, the first of the merchant vessels to leave the yard, made her official trial last week off the Delaware Capes, and as she is perfectly satisfactory to her owners, she will shortly be placed on the Ward Line, between New York and Havana. She is a fine vessel, 400 ft. long between perpendiculars, 50 ft. beam, 36½ ft. molded depth and will draw 20 ft. of water, her registered tonnage being 6,004 tons. The two other steamships for the Ward line are all in frame and the plating of them has begun. They are 341 ft. on the water line, 47½ ft. beam and 36 ft. depth of hold; when loaded they will draw 20 ft. of water.

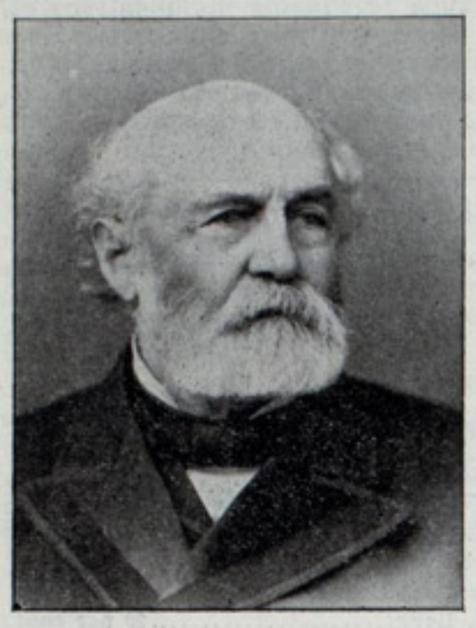
The Sierra for the Oceanic Steamship Co., launched several weeks ago, and the Sonoma for the same line, launched last week, are being pushed to completion as fast as possible. The Ventura, the other steamer being built for the same company, will be launched the latter part of this month or early in September. These three steamers are 400 ft. between perpendiculars, 50 ft. beam, with a molded depth of 36½ ft., registering over 6,000 tons and when loaded will draw 23 ft. of water.

The keels for the two new steamships for the American line have been laid and their frames are ready to be placed in position. These vessels will be 560 ft. between perpendiculars, 60 ft. beam and will have a depth of 42 ft. The keels for the two new steamships for the Clyde line will be laid shortly. These vessels will be 291 ft. between perpendiculars, 46 ft. beam and 30 ft. depth of hold.

Nearly 8,000 men are employed at Cramps ship yard at present, and this, according to a statement made by a member of the firm, is the greatest number of men employed at any one time in the history of the company.

### DEATH OF COLLIS P. HUNTINGTON.

Collis P. Huntington, president of the Southern Pacific Railroad Co., died at his camp, Pine Knob in the Adirondacks, about midnight Monday night. He had just been on a tour of inspection of his eastern properties and was apparently in the best of health. Last week he announced his determination to erect a $1,000,000 steel plant in connection with the ship yard of the Newport News Ship Building & Dry Dock Co. at Newport News, Va., and took a keen, active, personal interest in his business affairs. He reached Pine Knob on Friday last and was in the best of spirits. On Monday night he retired at 11 o'clock, feeling well, but an hour later was stricken with heart trouble and died almost instantly.



Nothing better illustrates Mr. Huntington's genius for organization than the inception and development of the ship building plant at Newport News. Mr. Huntington first visited this place in 1837 and was much impressed with its natural advantages. It has the finest harbor along the coast with a depth of water varying from 35 to 55 ft. Even as a man Huntington never forgot the impression which as a boy Newport News had made upon him. Long years after he had attained national fame as a railway magnate he returned to Newport News and established one of the greatest ship building plants in the world. The wonder of it is that this works established as late as 1888, is to-day exceeded by no plant on earth. In its equipment of tools and machinery and in economy of labor it is not second to any of the great ship building establishments. It has had under contract more ships for the navy and merchant marine than any other ship building plant in this country. And it is only twelve years old.

Mr. Huntington at the time of his death was president and director of the Southern Pacific Co., president and director of the Pacific Mail Steamship Co., president and director of the Southern Pacific Railroad Co. of California, director of the California Pacific Railroad Co., director of the Galveston, Harrisburg & San Antonio Railroad Co., president and director of the Guatemala Central Railroad, and director also in the following: Gulf, Western Texas & Pacific Railway, Louisiana Western Railroad, Mexican International road, Morgan's Louisiana & Texas Railroad & Steamship Co., Newport News Light & Water Co., New York, Texas & Mexican Railway Co., Old Dominion Steamship Co., Old Dominion Land Co., Oregon & California Railroad Co., Western Union Telegraph Co., Detroit Gas Co., Fuente Coal Co., and Metropolitan Trust Co., of New York.

Mr. Huntington was a native of Connecticut and was nearly eighty years of age at the time of his death. He started out in life for himself at the age of fourteen years and for ten years engaged in mercantile business and traveling in the West and South. His travels in the undeveloped sections opened his eyes to the future of the country and in his mercantile affairs he profited by the knowledge gained. In 1848, while in business with an older brother, the firm made a shipment of goods to California, which the younger brother followed, locating in Sacramento and doing business in a tent. Later he opened a large hardware store in that city and did an extensive business. In this enterprise he was associated with Mark Hopkins. In 1860 Huntington matured a scheme for a transcontinental railroad, Leland Stanford, Charles Crocker and Mr. Hopkins having united with him in paying the expenses of a survey across the Sierra Nevada mountains. Five men organized the Central Pacific Co., of which Mr. Stanford was president, Mr. Huntington vice president and Mr. Hopkins treasurer. After congress had agreed to aid the enterprise by an issue of bonds, Mr. Huntington and his associates carried on the construction of the railroad out of their private means until the bonds became available by the completion of a stipulated mileage.

In addition to this undertaking Mr. Huntington planned and perfected the whole California system of railroads, which extends over 8,900 miles of steel track, built an Atlantic system, which by the Southern Pacific and the Chesapeake & Ohio railway forms a continuous line 4,000 miles long from San Francisco to Newport News, and developed an aggregate of 16,900 miles of steam and water lines, including the route to China and Japan. Mr. Huntington, during the recent years of his life, resided in New York city. He was an uncompromising enemy of the construction of the Nicaraguan canal. His wealth is estimated at $50,000,000.

### A MYSTERIOUS SUBMARINE BOAT.

A submarine boat was launched from Ware's Island in Stamford Harbor, Conn., at high tide last Friday night. The man who superintended the construction of the boat is J. C. Carter of New York. He is supposed to represent a syndicate of New Yorkers, but it has been impossible to find out much about him. The boat has been in the course of construction for fifteen months. Extraordinary efforts were resorted to to keep everything about it secret. A large building was erected on the island, and there the boat was built. The end of the building was torn down and the craft appeared in sight of passing boatmen for the first time. She is 50 ft. long and 8 ft. beam. The propelling power is provided by two motors. These discharge water from the stern. The submerging of the boat is controlled by machinery on each side. She has side keels also, two bilge keels and three rudders. There are two torpedo tubes projecting from the conning tower just above the deck. The boat is built of yellow pine and is sheathed with galvanized iron.

The William R. Trigg Co., Richmond, Va., announces that it will bid on one battleship, one armored cruiser and one protected cruiser for the United States navy.

### COL. SAMUEL M. MANSFIELD.

Col. Samuel M. Mansfield, who is to succeed Col. Jared A. Smith as the government engineer at Cleveland this fall, has had a long and brilliant career in the army. He was entered as a cadet at West Point in 1858. At his graduation, four years later, he was appointed to the engineer corps with the rank of second-lieutenant. He saw service in the war of the rebellion from 1862 to 1866, first on the staff of Major General Mansfield and later in command of the Twenty-fourth regiment, Connecticut volunteers. On March 3, 1863, he was raised to the rank of first-lieutenant and served gallantly in the Louisiana campaign of '63. In June of the same year he was breveted captain for gallant and meritorious service in the action at Port Hudson, La.

Since Col. Mansfield was mustered out of the volunteer service he has been engaged in engineering work. He was assistant engineer in the construction of the fort at Sandy Hook, N. J., and chief engineer of the defenses of the West Pass in Narragansett bay. Besides this work he built temporary batteries at New Haven, Ct., and also the defenses at Point Lookout, Md. In August, 1864, he was made a captain in the engineer corps and seven months later was breveted major and later lieutenant colonel for gallant service during the rebellion. In 1866 the government undertook the survey of the upper Mississippi and Col. Mansfield was appointed assistant engineer of this work. From 1867 to 1872 he was at various stations both in New York state and California in command of engineering companies. In 1874 he was made a major of engineers and placed in charge of the harbor improvements which were being made on Lake Michigan. He held the Michigan station until 1879 and was then granted a leave of absence of one year. He spent the time in touring through Europe and returned to take charge of the river and harbor improvements in Texas. He was for six years engaged in this work and at its completion was appointed to the commission which in 1887 performed the arduous task of running the boundary line between Texas and the Indian territory.

Col. Mansfield has also had experience in light-house engineering. He was in charge of the tenth, eleventh and ninth light-house districts, in the order named, from 1886 to 1888. In 1888 he was placed in charge of river and harbor improvements in western Michigan and later in charge of the same work in northern Indiana. For ten years, from 1888 to 1898, he was in charge of the defensive works at Boston and at the expiration of his term of service there was made a colonel of engineers. Since that time Col. Mansfield has been on the Pacific slope with station at San Francisco. At the present time he is division engineer of the Pacific division and is in charge of the defenses in San Francisco harbor. He is a member of various boards and commissions appointed by the government to oversee the fortifications of the Pacific coast and the construction of the harbor lines of San Francisco harbor and adjacent waters. He is also on the examining board of officers which determines the competency of the officers of the engineer corps. Col. Mansfield held various other positions of responsibility, being president of the California debris commission, which regulates hydraulic mining; member of the general court-martial, member of Yaqunia bay commission and president of the commission appointed by the president to determine statistics of certain government roads in Yosemite park.

### AROUND THE GREAT LAKES.

Fire destroyed the Dakota elevator on Buffalo creek Monday. The loss is placed at $1,125,000. The elevator had a capacity of 850,000 bushels.

B. B. Inman, who has been in charge of harbor tugs at Duluth for a great number of years past, is planning for the organization of a tug line at that port to oppose the Great Lakes Towing Co.

Receipts of grain at Buffalo to the end of July, flaxseed included, were 63,219,414 bushels. This record has been exceeded only twice in the history of the port. The amount of flour received to the same date was 4,161,000 packages. This also has been exceeded only twice in a small way, and is considerably more than a quarter over the average for the past ten years. The receipts of iron ore were 568,500 tons, a third more than last season at this date.

All vessel masters are warned and requested, in entering and leaving Agate Bay (Two Harbors) Minn., to keep at least 500 ft. away from the westerly end of the east pier, on a line running southwest therefrom. There is a stone embankment there, upon which they are in danger of getting aground. They also run the risk of fouling their propeller wheels with wire and rope cables, which, as noted by Major Clinton B. Sears, are legally there by direction of the United States.

Two black spar buoys have been placed on the westerly edge of the channel in the St. Clair river, to mark the 20 ft. curve between the wreck of the schooner Fontana and the west bank of the river. The shortest distance between the Fontana and this curve is about 500 feet, and vessels will find 20 ft. and over between the wreck and the line marked by the two spar buoys referred to. The most northerly buoy is about 450 ft. due west from Fort Gratiot light-house, and the southerly buoy is about 300 ft. due south of the angle making out from the Grand Trunk car works.

The Great Northern Railway Co. is building a steel grain elevator of 2,500,000 bushels capacity at Superior, Wis., and Vice-president W. L. Hill, in discussing the subject, is reported to have said that "the saving by reduced insurance, etc., in a steel elevator will more than make up the difference in interest on the cost of the steel house, though it will cost twice as much per bushel as the wooden structure. The new steel elevator will be of 2,500,000 bushels capacity and will probably be ready for operation in 1902. The Great Northern road will then have 7,000,000 bushels capacity on the Duluth market, all but 1,800,000 of which will be the most modern steel construction, operated electrically."

One of the most profitable post offices in the United States is that at Scranton, Pa. The volume of business is unusually large and is steadily increasing, the figures for the first six months of the present year showing more than double the business for the same months in 1893. This is due principally to the rapid growth of the International Correspondence Schools. Seven years ago the schools' postage was barely 5 per cent. of the total, but now one-third of Scranton's postage is paid by the International Correspondence Schools. Their postage has increased from an average of less than $400 to over $5,000 a month.

### FIRE AT SEA ON A WHITE STAR LINER.

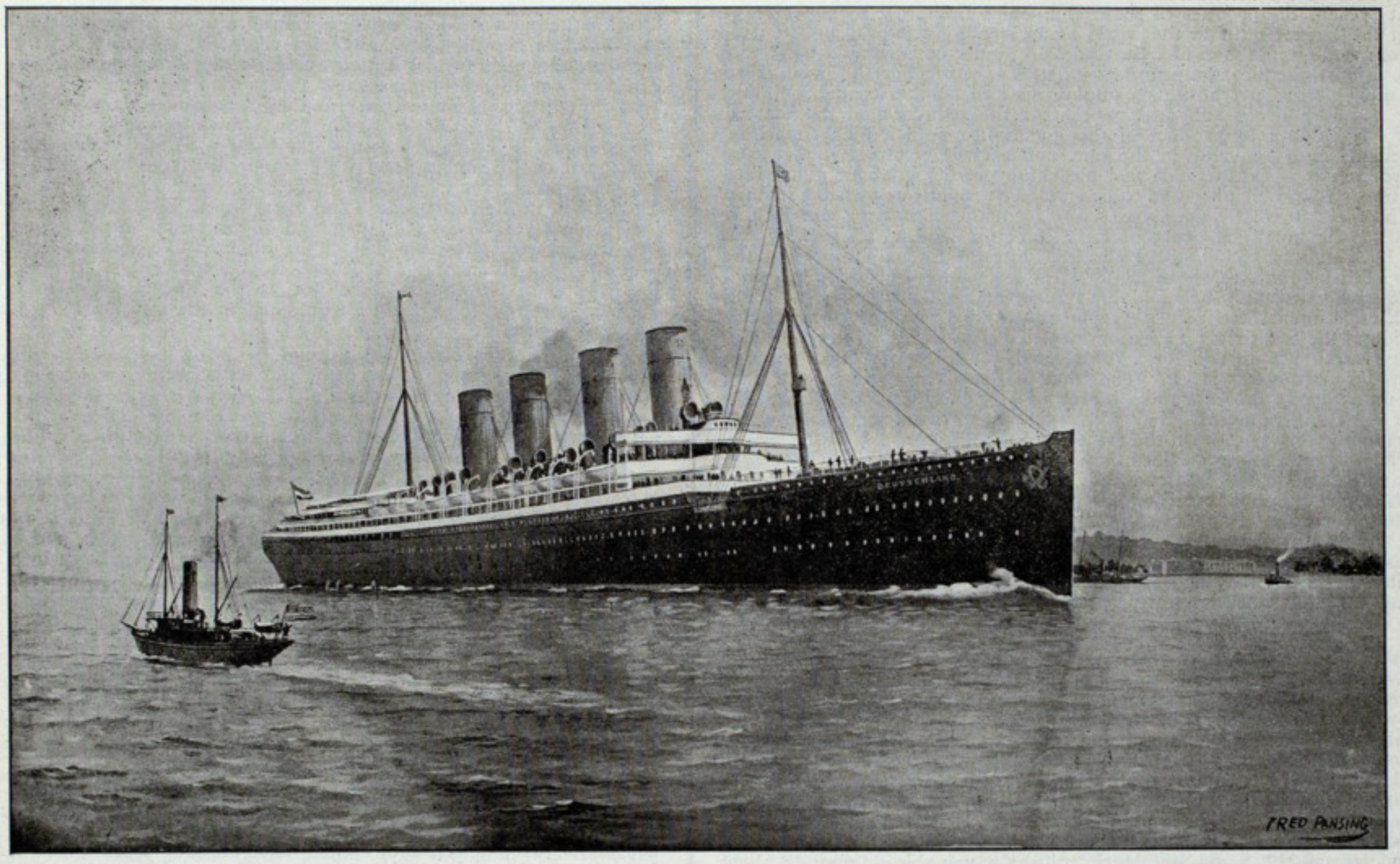
The White Star liner Cymric from Liverpool arrived in New York Monday with a thrilling yarn to spin of a fire at sea. For thirty-six hours the crew, led by the captain and officers, worked in the fore part of the ship fighting fire amid the fumes of chlorine gas, which laid the captain unconscious on the deck three times and similarly affected three of the officers and several members of the crew. When the fire was finally located in the bottom of the hold orders were given to open a sea cock and the flames were thus drowned out. When the Cymric arrived at her pier the only evidences of the fire were a charred space about 12 ft. square in the hold and a strong smell of chlorine gas in the fore part of the ship. The passengers were led to believe for a time that the crew was having an extra long fire drill. In this way they were kept in ignorance of what was really going on until the worst part of the fire was over. When they were informed of what had happened on the ship there was quite a scare, but before it had time to take on large proportions the officers went through the ship and announced to anxious inquirers that there was no danger.

The Cymric, although one of the newest ships of the line, is one of the slowest, as she was built to have a large freight-carrying capacity besides her passenger accommodations. She left Liverpool on Friday, Aug. 3, and when she steamed out of Queenstown the following Sunday morning there were on board 125 cabin and 248 steerage passengers. Six hours later the fire was discovered. This was at noon, the hour set for boat drill. Before the crew had really begun the drill, Capt. Lindsay, from his station on the bridge, saw smoke pouring out of one of the ventilators forward. He had hardly noticed it before the boatswain reported to him that there was a smell of something burning in hold No. 1, just abaft the forepeak and next to the first bulkhead. The deck was all the time getting hotter and smoke began to pour out of several other ventilators. Some of the crew were having difficulty to breathe. Capt. Lindsay saw by the diagram of the cargo, which is prepared as the ship loads, that in the first hold there was a lot of earthenware packed in straw; then on top of this were barrels of bleaching powder, interspersed among casks of soda ash. On the burlap deck was a general cargo of dry goods and bales of wool. The idea at once struck the captain that this general cargo was afire on the burlap deck. This was under the main deck. All hands were accordingly called down to the main deck. Fortunately the wind was fresh from the north and the smoke from the ventilators was blown over the ship's bow, without even a whiff of it getting to the passengers.

When part of the first hatch was finally loosened there was a puff of yellowish smoke. For a moment every man nearby was staggering and the hatch was dropped. Over it fell two of the crew unconscious. The ship's surgeon, Dr. Fleetwood, was called and the first taste he got of the gas convinced him that it was chlorine gas and that a sufficient quantity of it meant suffocation. The unconscious men were hauled up with ropes and laid out on the open deck. They were not breathing. Dr. Burden P. Craig, a passenger helped Dr. Fleetwood bring the two men back to consciousness, and they went back to join their comrades, who were again trying to get the hatch off. Suddenly another yellow cloud came up and this time one of those picked up unconscious was the captain. He was hardly breathing. First Officer Howarth was in a similar condition and around them was a crew of gasping, choking men. The two officers were hauled up to the open deck. Dr. Fleetwood and Dr. Craig improvised a hospital. The necessity for air was so great that the sick bay had to be near the bow, where the passengers could see it. When those who crowded the rail saw the inanimate forms stretched out on the deck the excitement among them was great. Capt. Lindsay, the moment he could stand, went back to face the deadly fumes again, as did his first officer. He had some of his subordinates say to the passengers that a rather extended fire drill was going on, which was only executed on Sundays. The improvised hospital, it was explained, was only part of the proceedings. The passengers thought it was theatrical. Whenever a man recovered consciousness he went down again to the deck below where the fight to lift the hatch was being kept up. Capt. Lindsay at each attempt persisted in helping the men, and he fell unconscious twice more. Chief Officer Evans, Second Officer Smith, Third Officer Fletcher, the boatswain and two other members of the crew were brought to the deck in the same condition. Some of them had to be rolled on barrels to induce respiration.

After nearly all of the crew were almost incapacitated for further work Capt. Lindsay, who had been revived for the third time, gave up trying to remove the hatch. In order to get water to the burlap deck he had the engineers bore two holes through the hatch, which is of 2-in. steel. Then the hose was brought and a flood of water poured in. Steam was also turned into the hold, although it was not believed for a long time that the fire was there. All Sunday night the men worked with the hose, and it was not till Monday, when the smoke still poured out of the ventilators, that it was determined, as a last resort, to open the seacock and flood the hold. This was done until the water rose to a height of 9 ft. When the fumes of the gas began to grow weaker the pumps were set to work and an examination of the hold was made. It was found that the ship had sustained no damage, as the fire had virtually been confined in a steel box. The gas had been formed by the fusion of the soda ash with the bleaching powder, which contains chlorate of sodium. The fire, Capt. Lindsay believes, was caused by the spontaneous combustion of the straw in which the earthenware was packed.

Before the fire was out the wiser ones among the passengers woke up to the fact that what they had seen was not play, and during most of Monday they watched the smoke pour out of the ventilators with considerable anxiety. They were told, however, that the fire would have to burn through steel before it could reach them, and in this way a panic was averted. It was admitted by the officers that it was several days before some of the passengers regained a state of composure. What the damage to the cargo was no one could estimate. There were about 600 tons of goods in the hold, most of which is a total loss.




**Fast Hamburg American Line Steamer Deutschland.**

She has just made the passage from Sandy Hook to Plymouth in 5 days, 11 hours and 45 minutes.

CHART NO. 1 OF ST. MARY'S RIVER has just been issued. Vessel masters of the great lakes have been looking for it for a long time past. It shows on a very large scale all the lower part of the river extending down from the lower end of Mud lake, where chart No. 2 begins, and including Detour, Drummond island and the lower part of St. Joseph's island, east and west, extending over to what is known as the North channel. This chart may be had from the Marine Review at 50 cents, or all three charts of the river at $1.50.

The James Rees & Sons Co., Pittsburg, are rebuilding their boiler and boat yards which were destroyed by fire on June 21. The new yards will be greatly improved.

## CLERGUE'S MAMMOTH ENTERPRISES.

*ANOTHER DESCRIPTION OF THE DEVELOPMENT OF GREAT WATER POWER AT SAULT STE. MARIE AND THE OPENING UP OF MINERAL AND TIMBER LANDS IN THE ALGOMA DISTRICT OF ONTARIO.

BY D. E. WOODBRIDGE IN THE IRON AGE.

There is now under way at the eastern end of Lake Superior a development of industries that is one of the most interesting of any new installation now progressing on the American continent. This development is based on two axiomatic propositions: 1, that the day of large and assured profits in competitive industries is declining and that such profits must be made from original processes, which processes will be to a certain extent monopolistic, using that word in its best sense; and, 2, that to be successful in the broadest way industrial development must utilize only such materials, ingredients and methods as being natural to the locality can be cheaply assembled at point of manufacture, and must utilize all of them, disregarding no by-product of commercial value that can without too great cost be made productive. These propositions, backed by skill, an enthusiasm and esprit du corps rarely excelled, ample capital and a directing mind of grasp and acumen, would seem a combination for results. This is, in brief, the situation as to the nine or ten associated companies located at the Sault Ste. Marie, Ont., that are now engaged in developing and utilizing the vast power of Lake Superior, under the leadership of Francis H. Clergue.

At present the product of these companies is limited to paper pulp, one of the largest mills in the world being steadily at work, and to iron ore from a mine just opened. But there are under construction what will be the largest chemical pulp mill in existence; works for the production from nickeliferous pyrrhotite of sulphurous and sulphuric acid, sulphite liquor and sulphurous anhydrid; works for the reduction of the roasted cinder, which is a by-product of this pyrrhotite, into a nickel steel or ferro-nickel alloy of value in the arts, and a large electrolytic plant for the production of caustic soda and bleaching powder is about going into operation. Works planned and to be erected as rapidly as possible include blast furnaces to treat hematite iron ore from the company's new Helen mines on the northeast coast of Lake Superior, and a rail mill to roll daily 1,000 tons of nickel steel rails, etc. For the immediate present the power used amounts to about 20,000 H. P., of which 14,000 are required by the mechanical pulp mill and the remainder for machine shops, alkali works, experiments, etc. But the company is constructing on the Michigan side of the Sault river a canal to furnish 50,000 H. P. Two weeks ago the first earth was turned for a third canal, to be on the Canadian side and to develop 40,000 H. P. The total of these three canals will give this one company the enormous power of 110,000 H. P., with Lake Superior for a mill pond, and they will utilize most, if not all, of the water now running to waste down the rapids of Ste. Marie.

The inception and growth of these industries so far, the new processes used and to be adopted in later works, and the personnel of the enterprise form a fascinating and absorbing story. The enterprise is the direct result of failure, for when disappointed in disposing of power from their original canal, built under the supposition that water power could be quickly and profitably sold to manufacturers, the company cast about for methods for utilizing the power they had harnessed, and every development made and making has been but a natural outgrowth and ramification from the first.

### BEGINNING WITH A PULP MILL.

When the company five years ago had completed their original 20,000 H. P. canal they were ready to sell power to manufacturers, but to their surprise no manufacturers seemed desirous of buying. The investment was too great to abandon, and the vast forests of spruce that cover Southern Algoma were a most natural and available resource. A pulp mill to turn out 100 tons a day of ground wood pulp was erected. Wood pulp was then shipped wet to the paper factory, and there was the added cost of freight on 55 per cent. of water and the loss by the straining of pulp by the decomposition of rosin in pulp fiber. These circumstances limited the market, and the paper makers of the great Wisconsin districts looked on and treated the Sault Ste. Marie mill as a valuable adjunct to them in the way of raw material, but as of no particular importance to its own stockholders. The company then invented and installed a drying attachment, and have since then reached a position where they are a great factor in the price of paper pulp in the western United States and in Canada. They are able and do ship to all parts of the world where paper is used. At present the product of this mill is worth about $900,000 per year, and the cost of manufacture must be very light on account of the enormous and practically free supplies of spruce wood close by, and the cheap power and excellent water Lake Superior furnishes.

But chemical pulp, treated with sulphur, is worth nearly double mechanical or ground pulp, and the company decided to erect a 100-ton sulphite mill. There were no adequate sources of sulphur nearer than those that would cost, delivered at Sault Ste. Marie, from $25 to $35 a ton. A hundred miles east of the Sault there are the extensive copper and nickel deposits of Sudbury, which is the world's chief nickel producer. There the Canadian Copper Co. were making a nickel matte and belching forth from furnaces vast volumes daily of sulphuric acid gas. The Canadian Copper Co. were asked to come to the Sault, where the paper mill would be a consumer of this waste. But the company stated that they had investigated the question of saving the gas from pyrrhotite and had found it impracticable for them. Mr. Clergue's experts were of the contrary opinion, and investigation in original processes at his laboratory, it is claimed, proved them correct. They claim to be able to produce a commercial product from the roasting pyrrhotite, a claim which those engaged in the chemical industries will need to have backed by convincing proof, on a working scale, before they accept it. Mr. Clergue then bought a nickel mine for the sulphur. To this mine and on to Georgian Bay his company are now building the Manitoulin & North Shore Railway, to develop their own and other nickel deposits of great extent. By a novel and original roasting process they claim to have been able to extract the last atom of sulphur from its ore, leaving a ferro-nickel ore. The construction of the sulphite pulp mill is now well advanced and it will this winter present many new processes in manufacture. With the ferro-nickel ore left after the elimination of the sulphur the company had something of potential value, and in line with their laid down policy set about its utilization. Furnaces were devised that, to the extent of a 5-ton unit, smelted this soft, high nickel material with a sufficient mixture of anhydrous sesquioxide of iron to make a hard nickel steel by the use of electricity as the smelting agent. All tools that require hardness in the company's large and well equipped machine shops are actually manufactured there from nickel steel reduced from the ore in their own 5-ton experimental furnaces. The company consider it settled that they can produce this alloy in large quantities at low price and are now proceeding on this theory in the widening of their industrial operations. They are now preparing to erect furnaces to make 250 tons daily, which are stated by them to be under a contract to supply the Krupp works at Essen, Germany. As yet, however, none of this material has been delivered.

*See Marine Review, April 5, 1900.

### IRON MINING AT MICHIPICOTON.

In the summer of 1897 a prospector searching for gold in the Michipicoton country, 125 miles north of the Sault, found an outcropping of hard hematite. He did not know its value or extent, had no funds with which to explore and offered his discovery to Mr. Clergue for $500. An investigation proved satisfactory and the money was paid. This ore gave the necessary ingredient for reducing the surplus nickel of the alloy and opened a tempting field for the miner. Eleven months ago there was sent from the Sault a scow loaded to the guards with men, tools, supplies, horses and a corps of civil engineers. Arriving in the perfectly land locked bay of Michipicoton, the supplies were unloaded in small boats, and the engineers and laborers spent the first day in cutting a hole in the forest large enough for their tents. Twelve miles to the northward, over as difficult a country as a mountain chain, lay the ore. There was no reconnoissance survey, no topographical plates, no guides of any nature. The next day the engineers began a survey to the mine and the laborers began the grade. July 12 this year the first cars of ore were hauled down over a line laid with 85-lb. steel, upon a dock and into ships bought by the company in England a few weeks before. Half of the eleven months consumed in this undertaking were winter, with the nearest supply point 125 miles away over impassable fields of ice and wastes of water. Every article used in the construction and operation of road and dock, from 110-ton locomotives, 50-ton steel cars and 67-ton steam shovels, to saw mills, ore crushers and down the list of the innumerable necessities, had to be brought from civilization and landed in this wilderness. Supplies not on the ground in November were not to be had at any cost till April. Neither men nor food could be obtained in the interim, except at great risk and high cost.

There is now completed a road of good alignment, with grades against traffic of under 1 per cent. and with traffic not exceeding 3 per cent., with a maximum curvature of 12°, with a heavy equipment, sidings, etc., and with a quarry of hard hematite ore at the end of it that is estimated from diamond drill borings to contain many million tons. A dock of a style absolutely new, capable when fully completed of loading perhaps 10,000 tons a day, is sufficiently advanced to handle cargoes with reasonable dispatch, and the company's equipment of 200 50-ton pressed steel cars is arriving, via scow, as rapidly as possible. This mine is a quarry of ore rising from a small lake to a height of perhaps 100 ft. and extending back to the base of a cliff 600 ft. Tunnels have been driven into the cliff 250 ft. further, at which point the capping of rock encountered, dipping away from the ore at about 50°. At the lake end the deposit dips under the water, and drill borings there have found ore 1,000 ft. from the further end of the tunnels and 125 ft. below the water line. The width of the deposit is said to be from 500 to 800 ft., part of it being of a lower grade soft ore not sufficiently rich for long shipment. The average shipments so far made to dock and by borings is about 62 per cent. iron, 0.04 to 0.05 phosphorus, and quite low in moisture. It is a specular hematite, somewhat porous and easily crushed, and experiments so far made in a small way have shown it easily smelted.

At the mine most of the deposit from the lake's edge to the base of the cliffs and for a part of the width has been stripped of the thin covering of vegetable mold and dirt, and is now bare to the eye. A No. 8 Gates crusher, capable of breaking a guaranteed amount of 5,000 tons a day, has been installed and is working finely. The crusher can probably break much more than the specified tonnage. A system of overhead Lidgerwood conveyors has been contracted for, to deliver ore from the various pits to these crushers, and the latter deliver crushed ore to cars by gravity. Levels will be cut from the faces on which the ore will be mined. The small lake at the edge of the deposit lies 28 ft. above another not a stone's throw distant, and this in turn is 120 ft. above a third, another stone's cast away, so that the entire lake at the mine can be siphoned out with small expense. Diamond drills have penetrated the deposit at various points to the depth of 240 ft., at which depth the character of the ore is apparently not much changed. This ore deposit is not, it would appear, an isolated outcropping, for the company have traced the ore bearing formation in the Huronian for sixty miles and have located several other ore bodies therein, none of which have been more than cursorily examined. One of these, ten miles from the Helen mine, shows a deposit of fine hematite of unknown extent. It is the opinion of the company that a sixth great ore range of Lake Superior has here been found, and they are proceeding on this theory in their search for mineral and in locating their land grants.

### A VAST LAND GRANT.

Within the past three weeks the Ontario government has granted the company a princely area, 1,650,000 acres in fee, including all mineral and timber rights, and to be selected within reasonable distance of their roads. One hundred and fifty expert mineralogists, geologists and woodsmen, each party of two men assisted by two Indians and equipped completely, are now in the forests included in this grant of seventy-one townships, verifying and correcting previous information from all sources, locating bodies of timber and favorable mineral bearing lands, and tracing the contacts of the formations lying along the northeast coast of Lake Superior. Considering the mineral possibilities for not only iron, but copper, gold and other minerals, and noting that the timber of the region is very largely spruce, and that spruce is almost indispensable for paper making and is becoming scarce and high elsewhere, the possible future value of such a grant passes beyond the reach of the imagination. The spruce on this grant grows to such a size that the company do not now, and do not expect in the future, to use for paper making logs of less than 6 in.

diameter. This fact is of particular interest to paper makers of the United States. It is owing in part to this, in part also to the new processes for which the company are continually striving, that they are able to make a ton of wood pulp from a cord of wood.

With the discovery of the iron mine and the beginning of its development into an important property it was evident that mining operations more extensive than its use as a mixture for ferro-nickel would allow should be undertaken, and the blast furnace proposition was attacked. Plans have been received from prominent engineers for furnaces of a capacity to furnish metal for a 1,000-ton rail mill, and they are intended to be erected within the next year. Subsequently a rail mill, to roll rails of their nickel steel alloy, is, it is stated, to be added. In connection with their blast furnace proposition the company have been experimenting along lines of startling interest, and if they are as successful in large practice, as they believe they have been in small experiments, will develop a process that is, to say the least, revolutionary. The plans for the ferro-nickel works propose 100 furnaces of a daily capacity of 5 tons each.

For the separation of the copper contained in the company's Sudbury ores processes were introduced necessitating the use of sodium in quantity, and by electrolysis at their alkali works they are decomposing salt into its constituents. The chlorine was a by-product, and to utilize this the company are proposing to manufacture bleaching liquor, using lime-water instead of lime as the medium to carry the chlorine, and in that way getting a higher percentage of chlorine in the combination. From their roasting plant the company expect to get sufficient sulphurous acid to far more than fill their own requirements, and will compress this into liquid sulphurous acid, which they will ship. They plan to supplant the use of imported sulphur in the sulphite mills of Canada at greatly reduced cost.

### THE COMPANY'S THREE POWER CANALS.

A subsidiary company in Michigan have recently closed contracts with the Union Carbide Co. and the United Alkali Co. to furnish these latter with 40,000 H. P. electrical energy on the American side of the Sault river. For this purpose and for their other industries present and prospective the company have need of immense water power. As has been stated, they have in operation on the Canadian side a canal furnishing some 20,000 H. P. On the Michigan side the excavation was on July 30 about 55 per cent. completed for a very large canal, furnishing with an available head of about 17 ft. some 50,000 H. P. This canal is 2½ miles long and carries a stream 20 ft. deep at a speed of 8 ft. per second. It is cut for half its length in a solid ledge of sandstone, the waste material from which is used for the construction of the substantial and handsome buildings of the company on both sides of the river. The canal is employing a large force of men and machinery; compressed air is used to drive the drills, channelers, etc., and in the rock sections these machines cut the sides of the permanent canal out of the solid ledge. The foundation of a magnificent power house, 1,380 ft. long, 100 ft. wide and 106 ft. high, is being laid and the building will go up rapidly. In this structure 320 turbines set in tandems of four will drive eighty single-phase dynamos. This work will probably be completed next year. Besides these two canals work was begun in July on a third, to be on the Canadian side and to develop 40,000 H. P. It will be similar in length to the Michigan canal. This work will be carried along slowly for a time and it will be several years before the canal is in operation.

These three canals will take a very large share of the flow of Lake Superior, leaving little or no water for the rapids. These are destined to become a mere rivulet, or a dry channel. Fear has been expressed by those whose interests were with the depth of water in the lock and ship-channel, and who were not conversant with the necessities of the power company's situation, that this would lower the available depth in the ship-canals. As a matter of fact, the company's entire investment rests on a constant and regular head, and they cannot afford to diminish the Lake Superior level. Every inch of fall means a heavy loss, and a large fall would simply cause a complete cessation of their electrolytic operations. This simple and sensible method of remedying any increase of flow through the water power canals would be by a system of submerged weirs, calculated to obstruct a flow equal to that going out by the canals, and this has been recommended by the company's engineer, Alfred Noble. But the government is disposed to require a more costly and complicated method, that of the stoney sluice, with steel shutters. There must therefore be built in the Sault river eighteen heavy rock and concrete piers, connected by steel shutters, expensive to erect and costly to operate. The first of these will be begun this fall on the Canadian side of the river.

### LABORATORY, MACHINE SHOPS, ETC.

The company have erected at the Sault a fine laboratory in which they test free of charge any minerals brought to them from any part of the country near their operations. The laboratory is thoroughly equipped, and analysis by electrolysis in many minerals is reguarly carried on. The chief metallurgist is E. A. Sjosledt, and Titus Ulke, late of the Anaconda Copper Co., is chief of a department for the company. As a part of the technical equipment is a library of current industrial publications in all languages, covering lines in which they are interested, and numbering something less than 100, which on receipt are bound, repaged consecutively and completely indexed. Twelve chemists are employed in analyses and experimentation.

Finding it unsatisfactory to secure elsewhere the machinery and tools required for many of their processes the company built a large machine shop, where they have erected all possible parts of their equipment. They have just completed and are now moving into an addition to this shop 100 x 180 ft. and two stories high, equipped with new tools throughout from the best makers in America. There are ten lines of tools, each 180 ft. long, driven by shafting from a central dynamo, the company considering this method better adapted to their purposes than separate motor driving. The entire shop employs about 250 men, and very little outside work is done there. A 50-foot traveling crane is provided, and a track of the company's railway, Algoma Central, runs through the building. A patent by one of their foremen is in use at all lathes by which metal is turned to a section of any desired shape.

The railway projects of the company are aided by the Ontario government, and besides their land grant they have within the past month received cash subsidies from the Dominion government of $360,000. The Algoma Central has ten miles of railed and ten more ready for steel, northerly from the Sault, and will reach a point 150 miles north next year. It is chartered and subsidized to Hudson bay, 500 miles north, and by the very recent purchase of the charter of the Hudson Bay & Sault Ste. Marie road it comes into line for an additional land grant of 1,250,000 acres and $500,000. This will be earned later. "We shall be running through trains to Hudson Bay, and carrying fish to Chicago from there inside of five years," said Mr. Clergue, when speaking of this part of the enterprise. The Sudbury line, named the Manitoulin & North Shore, which is likewise subsidized by the government, is being railed for a considerable portion of its ultimate length of seventy-five miles through the nickel belts.

### SCOPE OF THE SEVERAL ENTERPRISES.

The various companies under the control of F. H. Clergue and his brothers, E. V. and B. J., have so far spent between $4,000,000 and $5,000,000, and their daily payroll is more than $5,000. The projects they have in hand will cost $20,000,000. The mechanical pulp mill is now earning, it is claimed, at the rate of $900,000 per year, and is fixing the price of wood pulp in the west, and the sulphite mill will be earning $1,500,000 per year before winter. Rentals from leases of power already made at the Michigan canal will amount to nearly $500,000 a year, besides the portion of that power the company retain for their own use, which portion it is hoped to utilize for the extraction of silver from lake copper, and for the reduction of what ores of copper may be found in the region, etc.

In excavating for one of their buildings, Mr. Clergue opened into the original Hudson Bay Co. ship lock, by which their trading boats of 150 years ago passed around the rapids. The very existence of this lock had been forgotten. The long buried work was at once rescued from decay, its walls were relaid in stone and filled with running water. Surrounded by a protecting rail, it is now an interesting commentary on the progress that has been made since one lock 40 ft. long and 10 wide was ample for the commerce that to-day three, each from 600 to 1,000 ft. in length, and from 80 to 100 in width, are scarce able to accommodate. A short distance away was the Hudson bay block house, the scene of numerous Indian forays and encounters, surrounded by a rotting and scarce discernible stockade of timber. This block house Mr. Clergue repaired and it now has a comfortable and unique home. The faint line of the stockade was made permanent by a handsome stone wall surmounted by a unique parapet, and the ancient and tumble down Hudson bay warehouses in the rear have been set upon their feet. A cannon 150 years old was found on the premises and ornaments the inclosure.

At Michipicoton harbor, where the mining railway ends, E. V. Clergue has built a snug log dwelling upon the center of an isle of trap rock, than which no plainer lesson of the work of the glaciers has ever been noted. The entire isle is not only streaked by clear and sharp parallel lines of striation, but smooth gouges have been cut deep into the rock, running across the island from end to end. A side of one of these cuts forms half the height of one side of the building's lower story.

The Sault is so located with reference to rail and water transportation that it can send its products east or west over several lines of transcontinental rails, or by water it may reach without breaking bulk at any point on the lakes or on salt water. For the purpose of availing themselves of the new channels to Europe the company have received from England four steel steamships formerly in the Spanish ore trade, of a size to carry 2,500 tons down the St. Lawrence to the ocean. They will carry ore from the mine to Midland and Hamilton, Ont., and to American ports, and in the winter will ply the Atlantic. Four more ships of a similar character, but slightly larger and better adapted for lake requirements, are under order at English ship yards, and will be on the lakes next spring. It is the company's hope that the eight, and others besides, may be employed steadily next year in carrying their ore, but it is not probable that so large an output as they expect can be made. The company will undoubtedly be able, if their ore holds up as seems probable, to compete in the United States, notwithstanding the tariff, as they have practically no fixed charges against the mine, either for purchase or development; the rail haul is but twelve miles down hill, and the lake transportation is 250 miles less than from the head of Lake Superior. This latter is but a small item of saving, however. The purchase cost of the mine was only $500, to which the company after finding that they had an important property added employment for life to the two discoverers at a very liberal salary.

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## REPORT OF A GREAT FRENCH COMPANY.

The report of the Compagnie Generale Transatlantique, the French steamship line, for the year ending Dec. 31 has just been made public. It shows that the total assets of the company were $29,178,287. Receipts of all kinds, including bounties, were $9,558,542; total expenditures, $8,312,765. The total amount placed to the credit of the sinking fund since the origin of the company was $25,422,965. From the excess of receipts for the year 1899, amounting to $1,245,777, there was deducted the amount placed to the credit of the sinking and legal reserve funds, $993,757, leaving as net earnings $252,020, from which a dividend of 16 francs ($3.09) per share was declared. The emigration from Europe to the United States by the French line showed a marked increase. In 1898 there were 16,000 emigrants sent to New York via Havre, while in 1899 there were 23,000.

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The Japanese government did not inform the United States government that her dock at Kure could not be used by the Oregon long enough to make permanent repairs, as published in the newspapers recently. But our government, knowing the great value of the dock at Kure, felt that it would be an impossibility to monopolize so valuable an adjunct of the Japanese navy just at this time, and therefore decided that the Oregon shall be only temporarily repaired at present. The word "temporarily" conveys perhaps a false impression, inasmuch as the repairs which she will undergo will be complete as far as they go. The repairs to the injuries in her hull will be complete when she leaves the Kure dock, but the work of repairing the interior fittings to her injured compartments will be postponed until some convenient time in the future. It is said at the navy department that when she leaves the Kure dock the Oregon can resume active service and remain in commission as long as may be deemed necessary.

# MARINE REVIEW

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If the members of the committee on rivers and harbors, now touring the great lakes, could return to the St. Mary's river within the next day or two they would learn what a blockade means in that river. The schooner Maida, bound down in tow of the steamer Matoa, and loaded with a cargo of iron ore, parted her wheel chains when abreast of Sailors' Encampment in St. Mary's river and went aground across the channel. Navigation was completely blocked. The singular thing is that the accident occurs in almost exactly the same spot in which the Douglass Houghton went aground last year and blocked navigation for several days. The waiting boats, the stagnant navigation, would be a spectacle to the visiting members of congress. Last year's wreck cost the business interests $1,000,000; this year's wreck will also cost a considerable sum. The representatives who are now at Duluth will not return in time to see it. However they will doubtless be informed of it.

The trip of the representatives has been a signal one from beginning to end. They have found their days thoroughly employed. From morning to night not a moment has been lost. Indeed, if any criticism might be vouchsafed, it is that their days have been too crowded. They have not had time to digest what they have seen and heard. Perhaps in reflective moments they may get the benefit of it. However, their knowledge of the lakes is no longer geographical; it is actual. It is doubtful if the representatives saw a more instructive sight than that which was presented to them at the Lorain Steel Works. For facility and economy of handling, nothing could have been more startling. They saw the iron ore poured into the furnace, they saw it running out as pig iron; they saw it molten carried to the steel converter and subjected to roaring and terrific blasts of air; they saw it running out, a liquid steel, into ingot shaped vessels; they saw it whirled along railway tracks, still red hot, but solidified sufficiently to give it the shape of an ingot; they saw it automatically placed under rollers and rolled through successive stages into the shape of a steel rail; and they saw it emerge, still red hot, as a finished product and scarcely a human hand had touched it. The visiting representatives have indeed gone upon the greatest trip which it is possible to outline upon this continent. They could not duplicate it anywhere. When they came to the great lakes they came to the industrial center of the nation. Commercially there's nothing like it on this globe.

Bids received by the navy department last week for armor plate were extremely favorable in character. While they were rejected for a reason not inherent in themselves, they relieve the secretary of the navy of the necessity of considering the question of establishing a governmental armor plate factory. The bids are much lower than the sum which is now being paid by England and European powers for armor plate. The rejection of the bids was due to the fact that the bidders conditioned their bids on receiving certain minimum amounts of work, and the total of these minimum amounts was more than the entire lot of armor needed. New proposals have therefore been solicited. The bids were within the somewhat elastic limit fixed by congress, which directed the secretary to procure armor for $445 if he could, and if not, to pay no more than $545. The Carnegie and Bethlehem companies bid $490 a ton with the royalty paid and $445 with the royalty unpaid. The Midvale Steel Co., a rival in the field, underbid the identical proposals of the Carnegie and Bethlehem companies, but required twenty-six months in which to deliver the first lot of armor. They bid for the entire lot or for a minimum of 20,000 tons. As the navy department needs armor at once, it could not award the entire contract to the Midvale company; and as the Carnegie and Bethlehem companies had also fixed upon 15,000 as a minimum number of tons, it could not accept the joint minimum bids, for, if it did, it would be buying more armor than it needed. It is to be hoped that the difficulty, which is purely numerical, may be solved when the new bids are opened.

Straws will reveal a current and determine the direction of the wind. During the past week in Washington the public was apprised of the ill-feeling which exists among the members of the naval board of construction by the innocent desire of Rear Admiral Hichborn to disport himself in the surf at Atlantic City. The board, as it usually does on all important points, had disagreed on the designs for the three protected cruisers. Rear Admiral Hichborn thought the majority were trying to make armored cruisers out of them and entered his protest. At the same time he announced his determination to go bathing at Atlantic City. The upshot was that Rear Admiral O'Neil, chief of the bureau of ordnance, petitioned the assistant secretary of the navy to keep Hichborn in town until the controversy on the subject of the protected cruisers was settled. Hichborn lost no time in getting to the third floor of the state, war and navy building and telling O'Neil what he thought of him. He told O'Neil that he considered his conduct without warrant and unjustifiable in a bureau chief. He told the assistant secretary he would go to Atlantic City. And he went. Personally the naval board of construction is constantly at cross purposes. It has been a matter of note for some time that there is no love lost between Hichborn and Melville, the chief of engineering, and now it appears that Hichborn and O'Neil don't speak. Rear Admiral Bradford, chief of the bureau of equipment, too, has his opinions of certain members of the board. But, nevertheless, when they do get together they can build formidable battleships and unapproachable cruisers.

The Kaiser Wilhelm der Grosse of the North German Lloyd line and the Deutschland of the Hamburg-American line have just finished a sensational run across the ocean. The Kaiser left New York on Tuesday morning of last week and arrived in Southampton in 5 days, 19 hours and 44 minutes. She covered 3,184 miles. Her average speed was 22.79 knots, against the Deutschland's maiden record of 22.42. In making the average of 22.79 knots for the run the Kaiser lowered her own previous record of 22.61. Therefore for the speed record eastward she eclipsed herself and all her rivals. The daily records were 500, 524, 532, 533, 541 and 22 knots. But the Kaiser was queen only for the day. On Wednesday afternoon of last week the Deutschland, after suffering a delay of a few hours by low water, crossed the bar at Sandy Hook and arrived at Plymouth after a passage of 5 days, 11 hours and 45 minutes. Her highest day's run was 552 knots, and an average speed of 23.32 knots was maintained during the passage. This is a new record for the eastward passage and is the fastest time ever attained by any ocean steamer. She has beaten her own record by 3 hours and 21 minutes.

It is quite probable that the vessel interests of the great lakes will ask through the Lake Carriers' Association and Ship Masters' Association that the government inspectors of steam vessels take some action whereby vessels will not be delayed during the navigation season on account of the examination of masters and pilots under the rule that provides for examinations at stated periods. Great loss would undoubtedly result from vessels being tied up while the officers were journeying to the stations of the inspectors for examination. These examinations will be required in some cases during the coming year, but it is thought that in the meantime a system of temporary extensions may be devised so as to have all examinations on the lakes occur during the winter period when both inspectors and captains are at leisure.

## FOREIGN NAVAL NOTES.

A notable event in the building of warships was the launch on July 14 of the Marseillaise, a French armored cruiser of 10,014 tons, from the Salou slip at Brest. She has been constructed with great rapidity, having been just six months on the stocks, while the Iéna was seven months and the Suffren six and a half months building. The Marseillaise has 453 ft. length, 63 ft. 9 in. beam, and 24 ft. 7 in. draught. Protection is given by 6 in. of Harveyized steel at the water line, 7¾ in. on the gun positions and a 2-in. deck. She will have water tube boilers and engines to work up to 20,500 H. P. Her armament will consist of two 7.6-in. breechloaders and eight 6.4 in., six 3.9 in. and twenty-six smaller quick-firers. The Gloire, another armored cruiser of 10,000 tons, was launched at Lorient on June 27. Her armament is the same as that of the Marseillaise except that she has four fewer small quick-firers. The Condé, a sister ship, will be constructed on the same slip from which the Gloire was launched. The newly launched Marseillaise is a sister ship of the Admiral Aube.

The French naval defence bill that recently passed the Chambers authorizes the construction of six battleships of 14,865 tons, five armored cruisers of about 12,600 tons each and twenty-eight destroyers of about 300 tons, besides twenty-six torpedo boats. There being some difficulty in putting them all in hand at the same time in France, there were recently negotiations with the firm of Ansaldo of Sampierderna, near Genoa, in regard to the possibility of their undertaking the building of one or more of the armored cruisers. The proposal to build French warships in an Italian yard, however, raised such an outcry in a portion of the French press that it was dropped.

The new German battleship Wittelsbach, built as C at Wilhelmshaven, which was recently launched, is the first of a class of which D, E, F and G are in hand at the Schichau establishment at Danzig, at the Germania yard at Kiel, at the Vulcan yard at Stettin and at the dock yard at Wilhelmshaven. The earlier of the new battleships, the Kaiser Wilhelm der Grosse and the Kaiser Barbarossa, displace 11,000 tons, but the Wittelsbach class are of 800 tons greater displacement, and instead of engines of 13,000 H. P., will have them of 15,000, with which it is expected that they will attain a speed of 19 knots. Their coal capacity will be the same as in the Kaiser Wilhelm class, and the equipment of guns and torpedoes the same. Their completion is fixed for April, 1902.

## WHAT A CANAL WOULD SAVE.

IMPORTANCE OF AN ISTHMIAN WATERWAY TO THE AGRICULTURAL IMPLEMENT INDUSTRY.

By Wm. C. Barker.

As this question is now before congress, and a commission has been appointed to investigate and report as to its effect upon American industries, it makes the subject one of double interest at this time, both to American manufacturers of agricultural implements and to their customers in all trans-Pacific countries and those of the Pacific coast of this continent.

There are several phases of this subject, two of which are of special importance to the implement trade:

First. What will be the effect of an Isthmian canal on different sections of the country as compared with other sections; that is, would it affect the eastern states more than the central west or western states?

Second. Would the canal change the routes by which our goods would reach the countries referred to? If so, what effect would it have on the trade?

There seems to be a general impression among the manufacturers of the central and western states that this canal will be of little value to them, in a monetary sense, and it is in this sense we will consider this matter.

In talking with manufacturers and dealers located in these states they tell you that the Isthmian canal no doubt would help the manufacturers of the eastern and New England states, but they could not see wherein it would be of any benefit to them.

The character of agricultural implements produced by a manufacturer is largely influenced by the requirements of the section in which he is located; therefore the eastern and New England manufacturers make a class of implements adapted to the conditions of those sections. The western and central western manufacturers produce those suited to the conditions of their sections. Therefore, in seeking a foreign market the manufacturers of these various sections seek that market where the conditions are similar to those of their own.

The conditions found in the United Kingdom and on the continent of Europe are very similar to those of the eastern and New England states; therefore those manufacturers seek a market in those countries, while the conditions of Australia, Chile and Peru are closely allied with those of the central and western states; hence the manufacturers in those sections naturally seek the market of these countries, and as a consequence they are the ones who will reap the most benefit by the completion of the Isthmian canal.

There are four routes by which the products of our manufacturers reach these countries at the present time from the Atlantic seaboard—

First. Panama route to the Pacific ports of this continent.

Second. Direct steamer, going via Straits to same ports.

Third. Trans-continental rail to Pacific ports, thence by steamer to Australia.

Fourth. Direct steamers to Australian ports.

To show the comparative cost of transportation by these various routes we will take two countries, Australia and the west coast of South America.

The first and second route reaches the west coast only. The average time between ports for transportation of goods is via Panama, 40 days; via Straits, 120 days. The average rate per cubic foot is via Panama, 50 cents; via Straits, 20 cents.

The great drawback to shipping implements via Panama is the liability to damage in breaking bulk at Panama, transporting across the Isthmus and reshipping from the Pacific side and the delays incident thereto, and all who have occasion to use this route know what this means.

In making an estimate of what the saving will be in shipping to the west coast of South America via canal we are safe in calculating that steamers on this route will deliver our freight in the same time as at present via Panama and at the same rate as via Straits; therefore, there will be a net saving of 30 cents for each cubic foot and 60 days' interest and insurance on the value of the shipment. This means a total difference as shown below on every implement or machine that goes to the west coast of South America between the cost now and what it is estimated it will cost via the canal route, and will save time, interest and insurance from the cost of shipping via the Straits at the present time as indicated:

| | |
|---|---|
| Binders— | |
| In freight | $18 00 |
| Interest | 1 00 |
| Insurance | 20 |
| | $19 20 |
| Mowers— | |
| In freight | $ 9 00 |
| Interest | 30 |
| Insurance | 08 |
| | $ 9 38 |
| Plows— | |
| In freight | $ 1 80 |
| Interest | 12 |
| Insurance | 04 |
| | $ 1 96 |

The third and fourth routes are used for shipments to Australia, and the cost of freight by the third route averages $1.40 per 100 pounds, plus 25 cents per cubic foot, and takes an average of 40 days' time. This route is seldom used in the shipments of implements.

By the fourth route the average freight cost is 16 cents per cubic foot, and the time averages 110 days.

By canal the time should not be over forty days, and the rate should not be over 12 cents per foot, thus saving 4 cents per foot freight, 70 days' interest and insurance, which means a saving as follows:

| | |
|---|---|
| Binders— | |
| For freight | $ 2 40 |
| Interest | 1 16 |
| Insurance | 20 |
| | $ 3 76 |
| Mowers— | |
| For freight | $ 1 20 |
| Interest | 35 |
| Insurance | 08 |
| | $ 1 73 |
| Plows— | |
| For freight | $ 0 24 |
| Interest | 14 |
| Insurance | 04 |
| | $ 0 42 |

There are no statistics available to show the number of cubic tons of agricultural implements shipped annually to Pacific ports by the routes stated, but the average value of a cubic foot of implements is, binders, $1.50; mowers, $1.00; plows, $2.00, and by taking the statistical value given by the government for the year ending June 30 and dividing by the above we can get the approximate tonnage of each class, and with the figures above given it will be seen that many thousands of dollars annually would be saved to manufacturers and importers of implements by an Isthmian canal.

Implements intended for the west coast and Australian trade now require to be shipped about the time trade in this country is at its height, which makes the trade from those countries less desirable than it would be if shipments could be made sixty to ninety days later, which would thus extend the working season in our factories, reduce cost of production and make the trade of more value to our manufacturers and their workmen and increase the producing power of all. Therefore manufacturers and dealers in every part of this and the Pacific coast countries would be greatly benefited by the completion of an Isthmian canal, and manufacturers should exert their influence on their representatives in congress to enact proper legislation to have the United States government complete this canal as soon as possible.—American Trade.

## UNDER-FEED STOKER IN MARINE SERVICE.

From a great many points of view, one of the improvements most desired aboard steam vessels is a mechanical stoker that will work. They are a success in steam plants ashore, but many attempts to adapt them to the ship's fire hold have failed. The Under-Feed Stoker Co., 218 La Salle street, Chicago, one of the largest concerns of its kind in the country, and which manufactures the Jones under-feed stoker, claims to have successfully applied its devices to marine service. The catalogue issued by this company will certainly warrant consideration from vessel owners and ship builders. Stokers of this company's manufacture are successfully installed with Babcock & Wilcox, Sterling and Heine boilers, all of water kinds well known in marine service. Mr. J. R. Sinclair, manager of Chicago tugs now controlled by the Great Lakes Towing Co., makes a report regarding this stoker as applied to the harbor tugs Perfection and Mollie Spencer of Chicago. He says:

"An installation was perfected in the tug Perfection in February, 1894. After running this tug one year we equipped the tug Mollie Spencer with the same stoker. These boats have been in constant service ever since and the stokers are still in good condition. Our reason for making the equipment was that we could not keep up steam by hand firing in either of the tugs, not being able to get more than about two-thirds of the steaming capacity of the engines. Since installing the stokers we are able to get full capacity of the engines without any trouble. The tugs run so irregular that it is hard to arrive at the fuel saving definitely, but I am satisfied that we have reduced our fuel bills at least one-third. The cost of repairs is mere nominal. We bank our fires by simply discontinuing the blower and can get up steam very quickly by starting it. The Perfection is 90 ft. long, 19 ft. wide and 9 ft. hold; cylinders 14 and 28 in. by 24 in. stroke; marine boiler 7½ ft. in diameter, and 14 ft. long, with two furnaces, 6 ft. by 34 in. The Mollie Spencer is very similar to the Perfection."

The manufacturers say: "Marine boilers are as a rule internally fired, and our stokers can be successfully installed in boilers of this kind. We have had twelve stokers in operation in Scotch marine boilers for over a year in the plant of the Toronto Street Railway Co., with such satisfactory results that they gave us an order for four more and the sixteen are now doing perfect work. We installed five of our stokers in internally fired boilers for the London Electric Co. of London, Canada, where they have been in operation for three years and are to-day in perfect condition and a complete success. In the matter of marine installations we would emphasize particularly the importance of economy of fuel handling and fuel consumption, and also the resulting economy in bunker space and the greater steaming radius made possible through this system."

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Referring to an article printed in these columns recently regarding results attained with his patent valve gear, as applied to engines of one of the large lake freighters, the steamer Zenith City, Mr. Lincoln A. Lang of Yule, N. D., says: "It is perhaps well that your articles were in most respects simply descriptive of the gear and that official tests of the engines have been sufficiently delayed to admit of everything being worked into shape before these tests are made. We hear of continued improvement in the performance of the Zenith City. A letter from the engineer of the vessel informs me that during the last run down the lakes, loaded, a steady speed of 12½ miles an hour was maintained, while less fuel was used than on any previous occasion. The principal reason for this, I am informed, is that an actual vacuum of 22 in. now obtains, while we were only getting 17 in. earlier in the season, although the gauge read 22, due to a recently discovered defect in its mechanism."

## PETROLEUM FUEL FOR WAR SHIPS.

A SUMMARY OF ITS ADVANTAGES—RUSSIA AND THE UNITED STATES HAVE THE SUPPLIES—COST IS AGAINST ITS USE IN MERCHANT VESSELS.

BY ALTON D. ADAMS.

The speed and steaming radius of fighting ships is of the highest importance. Unfortunately, however, the requirements for high speed and for a long steaming radius are conflicting, both as to equipment and operation. The higher the speed to be maintained the greater must be the weight of driving machinery in a given case. The greater the actual rate of speed for a ship, the shorter its steaming radius. Both of these conditions result from the fact that the power required to force any vessel through the water varies approximately as the cube of its speed. A very large part of the tonnage or carrying capacity of a modern warship is taken up by its driving machinery and fuel, so that the constant effort of designers is to lighten the engines and boilers and extend the coal spaces. In so far as the fuel capacity of fighting vessels can be increased, the steaming radius can be lengthened, or the speed over a given distance raised. As far as can now be seen, the capacity for coal in war vessels has been pushed to nearly its utmost limit, unless some important modifications are made in the structure of their hulls or in the weights of the contained machinery. The tendency seems to be toward heavier instead of lighter armor in the most important classes of battleships, and while some gains are being made in the weights of engines and boilers, the net result in this latter direction can hardly be very important. At present the great naval powers of the world are nearly abreast of each other in the adoption of improvements as to the construction and equipment of ships of war. The foregoing makes it quite evident, however, that any great power, applying means to largely increase the fuel capacity of its ships without impairing their efficiency in other respects, would gain a decided advantage.

Especially would this be true if the means by which the large increase of fuel capacity is attained, is not generally available for the other powers. The ships having longer radii of operation, because of fuel capacities, beyond others of their class, would have still another advantage if the increase extended to the possible speed with given equipment. Important as are the advantages just pointed out, they are to-day within the grasp of two of the greatest powers, Russia and the United States. Petroleum is the fuel whose substitution for coal on warships will largely increase their steaming radii and to a smaller extent their speeds. As by far the most important deposits of this substance, thus far developed, are in the United States and Russia, the advantage of these countries in its use is plain. The ability of petroleum to largely increase the fuel capacity of fighting ships, without changing their present dimensions or machinery equipments, lies in its greater heating power over coal per unit of weight and volume. Steam coal of the best grades develops approximately 14,000 heat units per pound, on perfect combustion. The high grades of petroleum yield 21,000 units of heat per pound, when fully burned. With these two fuels in actual use under steam boilers, the results in the evaporation of water are more favorable to the petroleum than the figures just named indicate, because it is practicable to get more nearly perfect combustion of the oil than of the coal. In present ships, therefore, devoting the same tonnage to petroleum that is now devoted to coal, the fuel capacity with the former is more than 50 per cent greater than with the latter. This increase of fuel capacity gives the ships with oil fuel one and one-half times the steaming radius at any speed, the ability to attain a greater maximum speed and to continue it for a longer period.

Not only is the heating power of petroleum 50 per cent greater than that of coal for the same weight, but the same relation holds good for equal bulk. The weight of petroleum is very nearly fifty-four pounds per cubic foot, and this figure is also a fair average for a cubic foot of steam coal. Fighting ships may, therefore, increase their fuel capacities by one-half the present values with coal, without adding to either the present tonnage or bulk, by using oil. In the matters of rapid steam raising, long continued operation at maximum capacity, the removal of refuse from the furnace, and the labor of firing, the oil fuel is at a great advantage. Petroleum is fed to the furnace through pipes under pressure, and the heat of the fire is changed at once by regulating the flow of oil and supply of air. Much less than one per cent of the weight of petroleum remains as ash after combustion, while the ratio of ash in coal is 5 to 10 per cent. With oil the labor of firing is to a very large extent avoided, not more than one-fourth of the number of men required for coal are necessary, and their duties are much less exacting. This last point is seen to be of no small importance, when the great strain on the stoking force of war vessels on long and fast runs are considered. Petroleum fuel implies no material change in the steam power equipments now in general use on ships. The oil can be burned under any kind of boiler and its use may even alternate with that of coal. To apply the petroleum it is only necessary to introduce a pipe carrying it, and another pipe with compressed air or steam, into the furnace, and arrange suitable nozzles to insure a mixture of the oil in a finely divided state with the air or steam. Thus far the fuel properties of crude petroleum, as it comes from the earth, have been pointed out, but the heavy oil called refuse, that remains after the more volatile parts are extracted by distillation, has practically the same heating power per unit of bulk. This petroleum refuse constitutes 10 to 15 per cent by weight of the crude oil and is extensively used as fuel by ships on the Black and Caspian Seas and on locomotives in Southern Russia. The great Caspian oil fields and their refineries account for cheap petroleum refuse at the ports of the seas named.

Great as are the advantages to be derived from petroleum fuel on warships with steam power plants, still more favorable results seem possible if internal combustion motors are adopted. Steam boilers and their contained water form a large item in the weight of warship equipments, and the space and tonnage they require would be of the highest value for the storage of fuel. Oil engines require no boilers and consume less fuel than the best steam power equipments per unit of effective work. A fair approximate figure for the weight of ship boiler plants and their contained water is 150 lbs. per horse power capacity, where the best class of steam engines is used. In the petroleum engine .75 lb. of coal will develop a brake horse power hour, so that if the boilers are replaced by an equal weight of fuel oil the radius of action for the ship is increased to correspond with 200 hours of operation for its engines at full capacity. It must be said, however, that the development of very large oil engines, such as would be required to drive warships, is in the experimental stage, and the hopes now held for them may not be realized. Concerning the advantages of petroleum fuel for steam boilers there remains, however, no doubt whatever. It may be mentioned here that the so-called petroleum engines do not use the crude oil, but usually those products of distillation that are obtained at temperatures of 340° to 476° F. This part of petroleum, known as the illuminating oils, constitute about one-half of its total weight. The amount of coal consumed by navies is known to be very large, and it may be questioned whether the supply of petroleum is sufficient to permit its use for fuel under their boilers.

During the year 1898 there was produced in the United States petroleum to the amount of 8,500,000 tons. Allowing a large warship to consume 7,000 tons of coal per year on an average, the 8,500,000 tons of petroleum, with a heating power equal to 12,800,000 tons of coal, would supply 1,800 such ships. As it would be impracticable to devote the entire output of petroleum to naval purposes, the number of war vessels that could be supplied from present production in the United States would be a mere fraction of that just named. Unless the rate of petroleum production is very largely increased, it is quite evident that this desirable fuel cannot be generally and constantly used by the navies of the world. The great advantages to fighting ships of petroleum, in times of war, seems to indicate that naval powers will come to regard large natural deposits of this fuel with jealousy, and accumulate great stores of it at their coaling stations. Since petroleum may be used alternately with coal under the same boilers, it may well be that coal will continue to be the principal fuel for navies during times of peace, while petroleum is held in reserve for actual war. The commercial demands for petroleum are already tending to develop new fields of production, and its recognition as the most effective fuel for warships is sure to hasten this process. Petroleum is now produced on a very large scale in only the United States and Russia, and the export trade is carried on almost exclusively from these countries.

Deposits of petroleum in greater or less amounts seem to be almost as generally distributed as are those of coal. Most of the countries of Continental Europe produce small quantities of petroleum for home consumption, and in Germany and Austria the supply is quite large. The oil from Scotch shales is sufficient for a small part of the demand in Great Britain, where the annual import of the distilled products of petroleum is nearly 200,000,000 gallons. China and India have long produced some petroleum and are believed to have large deposits. Several islands of the Far East, as Japan, Borneo and Java, are said to promise future supplies of petroleum. In the Western Hemisphere vast quantities of petroleum are believed to exist in Canada, Mexico and several of the countries of South America. When these undeveloped fields are in operation, the supply of oil may be as plentiful as that of coal, but this seems improbable. Meantime petroleum fuel is being applied in some recent war vessels of Russia and the United States, with a decided increase of speed over that attained with coal. So long ago as the time of Admiral Selwin, petroleum was shown by the British navy to be a superior fuel. But it yet remains for Great Britain to take any definite steps for its general use. Merchant ships do not find the advantages of petroleum so important as do vessels of war, because steaming radius or rate of speed in the latter may determine the result of a battle or the fate of a nation. For the same cost of equivalent heating power, crude petroleum at 4 cents per gallon equals steam coal at $7.32 per ton. Petroleum must, therefore, be materially reduced in price before it becomes the general fuel for merchant ships.—Scientific American.

## DESIGN OF THREE PROTECTED CRUISERS.

At the meeting of the naval board on construction on Friday last Chief Constructor Hichborn presented a report dissenting from the recommendation of his four colleagues that the three protected cruisers authorized by congress last March should be of 9,500 tons displacement. Admiral Hichborn contended that as the law provided for vessels of "about 8,000 tons each" and for protected cruisers, the majority of the board had gone contrary to the law in expanding the displacement to such a marked degree and in providing side armor, thus contemplating armored cruisers. He held also that the weights provided were too excessive for the size of the type and that the vessels could not be built within the limit of the appropriation. Admiral Hichborn proposed an alternative plan for vessels of about 8,500 tons each without armor and with a speed of 23 knots an hour, instead of 22 knots, as contemplated by the board for the 9,500-ton cruisers.

The minority report will be submitted to the secretary of the navy with a response by the majority. The board maintains that it had the right to recommend 9,500-ton ships as the best vessels that could be constructed within the limit of the appropriation. It holds also that the weights arranged can be provided for within the displacement fixed. When the plans for the three cruisers were before the board, Admiral Hichborn voted for the 22-knot type, against a proposal to make the speed 23 knots, and the board will make a point of this in its response to his dissenting views. The board says, also, that it has recommended that the tonnage of other vessels be expanded as much as 27 per cent. beyond the tonnage suggested by congress, and that such vessels have been constructed. Its recommendation in regard to the displacement of the projected protected cruisers provides for an expansion of 19 per cent. Congress, the board will maintain in answer to Admiral Hichborn, gave ample discretion to the navy department to expand the size of the three vessels.

A personal controversy has resulted from Admiral Hichborn's objections. Admiral Hichborn had informed Admiral O'Neill, president of the board, that he intended to leave Washington for a three weeks' visit to Atlantic City. Admiral O'Neill objected to Admiral Hichborn leaving the city until the controversy had been adjusted. Thereupon Admiral Hichborn said he would submit his views in writing at once and did so, declaring that the dispute was now before the secretary of the navy for a decision. Admiral O'Neill complained to acting secretary Hackett of Admiral Hichborn's intention to leave Washington, and Mr. Hackett sent for Admiral Hichborn, whom he tried to persuade to remain in town. Admiral Hichborn told Mr. Hackett that he would go toy Atlantic City on Saturday.

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It is likely the Baltimore will go to the New York navy yard in a few weeks, placed out of commission and generally overhauled.

### LAUNCH OF THE LARGEST SCHOONER IN THE WORLD.

The largest schooner in the world, the first six-master ever built, a wooden vessel, was launched at the yard of Harvey M. Bean, at Camden, Me., on Tuesday last. This is the schooner George W. Wells, owned by Capt. John G. Crowley of Taunton, Mass., and parties in New York, Fall River and Southbridge, Mass., and to be commanded by Capt. Arthur Crowley, now of the five-masted schooner John B. Prescott. The keel of this vessel was laid on April 1. She is now practically completed as to hull, but such is her weight that the putting in of her masts was delayed until after the launching, for fear that the blocks upon which she rested would collapse altogether. Instead of spilling wine at her naming, the pretty daughter of the man for whom the vessel has been named scattered white roses over her bow, and as she moved down the ways a flock of white doves were liberated after the fashion favored by the Japanese.

Many large schooners have been built in American yards in recent years, but none of those now afloat approaches the George W. Wells in size. She is 302 ft. 11 in. long on the keel, 345 ft. long on top, 48 ft. 6 in. beam and 23 ft. deep. She has two full decks, with a poop 4 ft. deep extending from the taffrail to the forward hatch. Her frame is white oak throughout, and all her planking and ceiling hard pine. The garboards are 8 in. thick, other planking 6 in.; her ceiling to the lower deck beams is 12 and 14 in. thick. A notable feature of the construction of this vessel is her keelson, which is 13 ft. high aft, running up to a height of 17 ft. forward. In ordinary vessels a man can easily climb over the keelson, but in this schooner it extends up to the lower deck beams, which are bolted to it, and so it acts as a great backbone to strengthen the vessel. This keelson is built up of hard pine timbers, 14 in. square, and is fastened with fifty tons of 1⅜-in. iron bolts.

So great is the sweep of her deck that the vessel's houses, although of generous size, look very small. Her after house is 36 ft. square; amidships is the galley, and forward the engine house and forecastle, while she also has a wheelhouse for use in heavy weather, something that is seldom found on coasting vessels. The six lower masts are splendid sticks of Oregon pine, each 119 ft. long and 30 in. in diameter in the partners; the topmasts are each 58 ft. long, the foretopmast being 20 in. in diameter in the cap. The jibboom is 75 ft. long, and 20 in. in diameter in the cap. The driver boom is 75 ft. long and 18 in. in the slings. The other booms are 42 ft. long and 14 in. in the slings. Her foretopmast, driver boom and jibboom are of Oregon pine, and all other spars are of native spruce. All the standing rigging is of wire, set up with turnbuckles. The masts are named as follows, beginning forward: Foremast, mainmast, missenmast, spankermast, jiggermast and drivermast. The vessel will carry 12,000 square yards of the heaviest duck in the following pieces: Driver, Jigger, spanker, mizzen, main and foresails; six gaff topsails of the same respective designations; driver, jigger, spanker, mizzen and maintopmast staysails; five jibs.

In the after house are the cabins and six staterooms, besides a chart room. The staterooms will be occupied by the master, steward, two mates and engineer, and, including the chart room, which can be fitted up with sleeping accommodations, there will be two spare rooms for passengers. The cabins and staterooms are finished in ash, sycamore and cherry, and supplied with steam heat, baths, hot and cold water, electric bells and a telephone line to the galley and engine house.

In the construction of this vessel there have been used immense quantities of materials, including 550 tons of white oak timber, 1,000,000 feet of hard pine, about 100,000 feet of white pine deck plank and several hundred tons of iron and copper bolts. Her materials would make a load for several good-sized schooners. The George W. Wells is not only of immense size, but also a very handsome vessel, being much the best looking of all the large schooners. Her great length takes away any appearance of bulkiness, and as she lies on the ways in Bean's yard she looks like an immense yacht, with her sharp bows, clean run aft and graceful lines all over. The 2,100-ton five-master on the stocks alongside looks short and chunky compared with the six-master. A mere statement of her dimensions conveys to the landsman but a faint idea of her size. Some comparisons will assist. Few full-rigged ships, either of wood or metal, are as large as this schooner, and the next largest schooners now afloat, the John B. Prescott and Nathaniel T. Palmer, are each about 500 tons smaller than she. The largest steamer running to Bangor is 58 ft. shorter on top than the six-master; twelve vessels like her, ranged in a line, would occupy a mile of pier frontage, for, from tip of her driver boom to the tip of her jibboom, this vessel is about 425 ft. long. She can carry as much coal at one load as three of the Philadelphia & Reading Railroad steam colliers, and about twice as much as the first five-masted schooner ever built, the Gov. Ames. A schooner that would have been called large twenty years ago could not carry enough coal to ballast this big fellow of the Camden yard. There is no reason why this big schooner should not be a great money-maker, as she can carry more than 5,000 tons of coal on a draught of 24 ft., with only fourteen men, all told, for crew. She can carry 800 tons more than the five-master John B. Prescott, the biggest schooner now afloat, with only one more man for crew. Her managing owner, Capt. John G. Crowley, thinks that she can easily beat the barges at coal carrying, even when freights are low. A full-rigged ship of equal size would carry at least thirty-one men as crew.

Capt. John G. Crowley, for whom the vessel has been built, is the most prominent master in the American coasting trade. He was born in Plymouth, Mass., and now resides in Taunton, Mass. He is forty-four years old, but looks much younger, for the sea has not aged him. At ten years of age he went as cook in the schooner Caroline Cornelia of Somerset, Mass., and has followed the sea ever since. The first vessel of which he was master was the schooner Florence Dean, of about 500 tons. The first vessel built for him was the schooner Henry S. Culver, at Alexandria, Va., of about 750 tons, and his first big vessel was the four-master Mount Hope, 989 tons, built at Camden in 1887. Other big schooners built for Capt. Crowley have been the Sagamore, at Kennebunk, Me., and the Henry W. Cramp and John B. Prescott, at Camden. Now comes the George W. Wells, the king of all schooners, and he is also having built at Camden a five-master of 2,150 tons net register, to be named the Van-Alen-Boughton, after an old and famous New York firm. He will go one trip in the George W. Wells, and then turn her over to his brother, Capt. Arthur Crowley, now master of the John B. Prescott. Capt. Arthur Crowley is only thirty years old, but, like his brother, he is a thorough sailor, having been at sea since early boyhood.

Capt. John G. Crowley denies the report that he is to have a seven-master built. He says the six-master is the limit. He thinks six masts better than five in a vessel of this size, for the extra mast makes the booms shorter and, consequently, the sails smaller and lighter. In a five-master of the Wells's size the booms, except the driver, would be 50 ft. long, whereas in the Wells they are only 42 ft. long.

At Bath a six-masted schooner of nearly the same dimensions as those of the Wells will be launched in October, and she is to be commanded by Capt. "Linc" Jewett, the famous skipper of the Charles P. Notman, which recently was sunk by the Mallory steamer Colorado. There has been some rivalry between Bath and Camden as to which should produce the largest schooner, and Camden appears to have beaten the Kennebec port by a few feet and a few tons. The career of these two large schooners will be watched with interest by the shipping world.

### ANNUAL REPORT OF THE CRAMP COMPANY.

The annual report of the Wm. Cramp & Sons Ship & Engine Building Co. has been issued, and makes the following showing as compared with the previous year.

| | 1899-1900. | | 1898-1899. |
|---|---|---|---|
| Gross earnings | $7,791,560 | | $5,300,000 |
| Operating expenses | 6,878,560 | | (?) |
| Net profits | $913,000 | | (?) |
| Fixed and other charges | 376,738 | | (?) |
| Balance | $536,262 | | $331,250 |
| Dividends (5 per cent.) | 242,400 | (2½) | 121,200 |
| Surplus | $293,862 | | $210,050 |

From the above it will be seen that dividends were increased from 2½ to 5 per cent., yet the surplus rose to $293,862 from $210,050 the previous year. The surplus of assets over liabilities is stated as $1,848,044. The contracts on hand aggregate $20,341,000, of which $12,212,000 represents the amount unfinished. The work in hand or on the books includes, with other vessels, the following steamships:

| | Gross tons. |
|---|---|
| New York & Cuba Mail Steamship Co. (Ward Line), two, each | 4,500 |
| New York & Cuba, Morro Castle | 8,000 |
| International Navigation Co., two, each | 12,000 |
| Oceanic Steamship Co., three, each | 6,500 |
| Wm. P. Clyde & Co., two, average | 3,250 |

United States battleships Alabama and Maine, Russian battleships Retvizan and Variag.

Several of the above are about completed. The president in his report says: "The growth of your business imperatively requiring enlargement of the plant, a property owned by the Lehigh Valley Railroad Co., contiguous to the ship yard on the south and southwest, and containing 11¼ acres, was purchased in your interest. On this property a machine shop is in course of erection, 332 ft. long and 140 ft. wide, containing about 85,000 square ft. of floor space, and equipped with the most modern and improved machinery. A power house is also building which, when completed, will be the most perfect of its kind, being practically fire proof and built with a view to economy in distributing the power to the various shops. Two new slips and three piers have been completed on the river front of this property, and on the slips are building the two ships for the International Navigation Co. now under contract. Between these slips a large gantry crane is in process of erection. When these improvements are completed the extent and arrangement of your plant will not be equaled by any on this continent and by few in the world, and the economy of manufacture will be greatly increased. In addition to the above, the ship yard formerly operated by the Charles Hillman Ship & Engine Building Co. was acquired in your interest. Title will be taken in the name of the Kensington Ship Yard Co., who will operate the yard, but all of the shares of the capital stock will be owned by your company. This yard adjoins on the north your basin, dry dock and marine railway, and its operation in connection therewith will afford an urgently needed increase of facilities for repair work."

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"The launching of the three-masted schooner in Bath lately," said a Maine shipping man, "is in my opinion the beginning of a revival in three-masters. Within the last few years comparatively no vessels of this class have been built, all the money being put into four-masters and recently into five and six-masters. Now, however, that we have Cuba and Porto Rico and that there are signs of a renewal of commerce between the southern islands three-masters will come into use, in fact they will be the vessels which will be most employed if the present indications prove correct. A three-master has many advantages over the larger vessels for this sort of commerce and though a four-master has a greater carrying capacity for general service in the islands the almost forgotten three-master is preferable."

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A note just received from the Standard Pneumatic Tool Co. of Chicago is in substance as follows: "Inasmuch as it has been called to our notice that a large number of users and prospective users of pneumatic tools are under the impression that suit has been entered against us by one of our competitors for infringement of their patents, on account of the fact that they have brought suit against various pneumatic tool companies, we wish to notify the trade in general through your publication that we are not involved in any way, shape or manner in the litigation mentioned, as all our 'Little Giant' pneumatic tools are fully covered by patents, the validity of which is not questioned by anyone."

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Messrs. Swan & Hunter of Wallsend, England, are about to build from designs by Clark & Standfield a self-careening floating dock for Bermuda. Its lifting power is about 18,000 tons, with a length of 550 ft. over keel blocks and an entrance of 100 ft.

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Fire last week totally destroyed the works of the Shelby Steel Tube Co. and the Boston Electroduct Co. at Beaver Falls, Pa., doing damage to the extent of $300,000. The loss is fully covered by insurance.

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Mr. J. E. Thornycroft of London has invented a water tube boiler of a modified Belleville type which is now attracting attention in Great Britain.

## MACHINERY FOR ARMORED CRUISERS.

A DISCUSSION BY ENGINEER-IN-CHIEF GEO. W. MELVILLE OF THE UNITED STATES NAVY DEALING WITH DIFFERENT DESIGNS.

From the Engineer, London.

The preliminary designs have been made, and it is proposed to compare briefly the merits and demerits of each. These designs are as follows: First, a triple-screw arrangement with the wing engines of about half the power of the centre screw, all placed abreast each other in the ship; second, the same arrangement as the first, except the centre engine is placed aft of the two wing engines; third, the ordinary twin-screw arrangement. In all of these designs it is proposed to use four-cylinder triple-expansion engines of the usual type to work at a maximum pressure of 250 lbs. and differing only in size. The boiler installation would be the same in each case except the first, in which, owing to the great width required for the three engines to be placed abreast, the engines would have to be placed so near the midship section of the ship that a part of the boilers would have to be placed abaft the engine compartment. The same indicated horse power being required in each case for the highest speed, the same boiler power would have to be supplied, and the same weight and space for boilers would be required in either case, so that the boiler problem can be eliminated.

The weights of the engines will be practically the same except in the first case, when, owing to the engines being placed somewhat further forward, the shafts would have to be somewhat longer, which would make this arrangement a trifle heavier. To offset this extra weight there would be less armor required for the protection of the engines, for in this case but one of the engines would project above the protective deck, while in the case of the twin-screw engines both would project above the deck. The space required for the engines in the first case would be 54 ft. in length by a total width of 52 ft., or a floor space of 2808 sq. ft. In the second plan the forward engine-rooms containing the two smaller engines would be 34 ft. long by about 18 ft. wide, and the after one would be 54 ft. by 30 ft., or a total length of 88 ft., and a floor space of about 2844 sq. ft. In the third plan the place required for the engines will be 54 ft. in length by an average width of about 47 ft. 4 in., or a floor space of 2556 sq. ft. The floor space for the first and second plans does not differ much, but the third plan is considerably less. The second plan requires the greatest length. The wing screw shafts would also be placed at a greater inclination, thus reducing the maneuvering power of the vessel.

With regard to spare parts, the twin-screw engines being duplicates will require a less variety of spare parts. While cruising, both engines will be in use, so that practically no repairs can be made to the main engines in the twin-screw design while at sea. With the triple screw, either the two wing or the centre engine will probably be used alone while cruising, thus allowing overhauling to be done on part of the main engines while at sea. For this reason less time will be required for overhauling the triple-screw engines in port than for the twin-screw type.

The important point of economy now remains to be considered. If we take two ships of exactly the same shape, the same displacement, and the same indicated horse power, but fit one with twin and the other with triple screws, we cannot say from the experimental data on hand which will be the faster ship. We do know, however, that there is no very marked difference where the draught is sufficient to permit screws of the proper diameter to be used. We cannot do better than to assume that it will require the same indicated horse power for full power that the economy for full power would be the same in either case. The ratio of cylinders in naval engines is not sufficient to give the most efficient results at full speed, since it would decrease the economy too much for the usual cruising speeds. In the case of these engines the most economical point for the engines would be when the steam pressure in the high-pressure chest was about 160 lb., or when the engines were developing about 12,600 I. H. P. which would give a speed of 19 knots. At full power, with all the screws running, the wing engines will develop 11,500 I. H. P.

With the wing screws working at full pressure but the centre screw stopped, the revolutions will be less, and the engines will develop only about 9000 I. H. P. and a speed of 17¼ knots. When these engines are working at their most economical power, corresponding to a pressure of 160 lb., their power would be about 5,300, and the speed 14½ knots. At 13 knots the I. H. P. would be 3,900, and the engine would be working up to $\frac{3900}{5300}$ =73.6 per cent. of its most economical power. At 12 knots the I. H. P. would be 3,000, and the engine would be working up to $\frac{3000}{5300}$ =56.6 per cent. of its most economical power. For 11 and 10 knots the I. H. P. would be 2,500 and 2,000, and the percentages of most economical powers would be 47.2 and 37.7. If the twin-screw engines were used the I. H. P. would be the same; but the percentages would be but half as much, or 14½ knots, 50 per cent.; 13 knots, 36.8 per cent.; 12 knots, 28.3 per cent.; 11 knots, 23.6 per cent.; and 10 knots, 18.8 per cent.

Thus far we have not taken into consideration the drag of the centre screws. This would have to be added to the I. H. P. of the wing screws to get the power required. This amount is not exactly known, but we may assume that 200 is a fair valuation for 10 knots speed. This gives 2,200 as the I. H. P. of the main engines for wing screw alone, against 2,000 for the twin-screw engine at a speed of 10 knots. It also includes the difference in friction of the wing and twin-screw engines. The real comparison, then, should be made between engines developing 2,200 I. H. P., when working at about 38 per cent. of their most economical power, and engines developing 2,000 I. H. P. when working at 19 per cent. of their most economical power. The auxiliaries, so far as they would differ in the two cases, should also be taken into consideration. The only auxiliaries which would affect the result are probably the air and circulating pumps, which would do about twice as much work in the case of the larger engine as in the smaller. This is especially true of the air pump, which has to deal with air leaks into the system, for decreasing the work of an engine usually increases the leaks. The air and circulating pumps for the larger engines will require about 60 I. H. P. to drive them, while half that will be sufficient for the smaller ones, making a saving of about 30 I. H. P.

The Pennsylvania, lake transport, when working at her full power, which was probably about her most economical point, used 14.4 lb. of water per I. H. P. This was increased to 20.0 lb. when working at about 18 per cent. of her full power, and to 17.26 lb. when working at 27 per cent., and 15 lb. at 59 per cent. By constructing a curve we get a steam consumption of about 16.1 at 38 per cent. The Minneapolis at about one-ninth of her full power used 20.4 lb. of steam per I. H. P., and this increased to 21.2 lb. at one-eleventh. Reduced to percentages of most economical power, these would become about 17 and 13 per cent. respectively. It seems a reasonable allowance to assume 20 lb. of water per I. H. P. at 19 per cent. of the most economical power, and not more than 17 lb. when working at 38 per cent. of the same power. The comparison will then be as follows:

For the twin-screw system at 10 knots.—Main engine 2,000 I. H. P. at 20 lb., 40,000 per hour; air and circulating pump 60 I. H. P. at 75 lb., 4,500 per hour; total 44,500 per hour.

For the triple-screw system using wing engines alone at 10 knots.—Main engines 2,200 I. H. P. at 17 lb., 37,400 per hour; air and circulating pump 30 I. H. P. at 75 lb., 2,250 per hour; total, 39,650 per hour; saving in steam per hour, 4,850 lbs.

The saving in coal per hour, assuming an evaporation of 8.4 lb. of water per pound of coal, would be

$$\frac{4850}{8.4} = 577 \text{ lb. of coal per hour.} \quad \frac{577 \times 24}{2240} = 6.18 \text{ tons.}$$

Allowing eight tons per day for other purposes not given above, we have for the total consumption per day with twin screws at 10 knots,

$$\frac{44{,}500 \times 24}{8.4 \times 2240} + 8 = 64.77 \text{ tons.}$$

For the triple screw, using wing engines alone,

$$\frac{39{,}650 \times 24}{8.4 \times 2240} + 8 = 58.59.$$

The gain in per cent. is therefore about, for total coal used,

$$\frac{6.18 \times 100}{64.77} = 9.5 \text{ per cent.}$$

And of the coal used by main engines, air and circulating pumps alone, about

$$\frac{6.18 \times 100}{56.77} = 10.9 \text{ per cent.}$$

## MACHINERY OF FIGHTING SHIPS.

WHICH TYPE IS BEST ADAPTED TO THOSE OF MODERN CONSTRUCTION? A SUBJECT THAT IS DEMANDING GREAT ATTENTION IN BOTH BRITISH AND AMERICAN NAVIES.

In another part of this issue will be found the views of Admiral Melville, chief engineer of the United States navy, on the subject of machinery for our latest armored cruisers, brought out in England on account of parliamentary inquiry regarding the construction and working of propelling machinery of the British navy. The Engineer of London, which has devoted a great deal of space to this subject of late, discusses in the following editorial Admiral Melville's paper, as well as recent communications on the subject from the British admiralty:

"To begin with, every steam engine has a speed, a load, and an average pressure, which, other things being equal, are more economical than any other speeds, loads, and pressures. That is to say, certain conditions of working require less steam in pounds weight per H. P. per hour than any other set of conditions. It is the aim of the designer to secure the presence of these conditions as far as possible. Now, in a mail or passenger steamer we find as one ruling factor that the engines run continuously for considerable periods, varying, let us say, between a week and three weeks. The intended speed is known; the power is known; and the engines are designed to give out the power under conditions as favorable to economy as possible. These, again, are fairly well understood. Indeed, they are approximately fixed by controlling considerations which cannot be altered. Thus, for example, the average pressure is in the main determined by the ratio of expansion, and that again depends—other things being equal—on the boiler pressure. The terminal pressure in the last cylinder will be approximately 7 lbs. absolute. To go below that is waste. If we divide the initial pressure by this, we get the ratio of expansion. Say the initial pressure is 175 lbs. then the ratio of expansion will be 25 to 1, and the average pressure will by calculation be 29.5 lbs. In practice the average pressure will be less than this, because of various sources of loss; but the effect of these is fairly well understood. Allowances can be made, and the dimensions of the engines fixed with fair accuracy. Now, other things once more being equal, the higher the average pressure the smaller the engines may be for a given power. In the Atlantic liner no attention is paid to this. The engines are designed to work at that pressure which is found to suit them best, quite irrespective of size; and be it remembered that they will be always worked as far as possible at the same speed and pressure, and that speed and pressure the best possible. It is, furthermore, well known that an engine too big for its work is uneconomical, because cylinder condensation is greatly increased. The loss by internal friction is also augmented. On the other hand, if an engine is too small for its work there is loss, because owing to the want of cylinder capacity the average pressure is too high, the terminal pressure rising above 7 lbs., probably to 10 lbs., or something much more. The margin is not very large, and much talent, based on experience, is required so to proportion the size of the engine to the work to be done that the least coal possible shall be burned.

"Turning now to fighting ships, we find a very different set of ruling conditions. The engines have to give the ships all sorts of speeds, from the highest to the lowest, and the best that can be done is to effect a compromise. The engines are designed to give the best results at some moderate cruising speed. For lower speeds they are too large; for higher speeds they are too small; and the further we depart from the best speed the worst are the results. For this reason it is, as we have already pointed out, most unfair to compare the performance of a fighting ship with that

of an Atlantic liner. The fighting ship could only compete in economy with the liner if she was invariably run at one speed. In the case of the liner, her most economical speed is also the fastest speed. If it is not, then her engines are too small. We may safely say that they are never too large. The engines of the warship do not work to the best advantage at full power. It will be seen that in the case of the fighting ship, the designer has to consider with much care what is the best compromise he can effect. In order to save coal at cruising speeds he might so proportion his engines that they could not be kept running for many hours at the highest speed for lack of fuel; and, on the other hand, they may be so wasteful at low power, that on paper their performance may appear intolerably bad. But, on the whole, it seems that it is better to err on the side of wasting steam at low powers rather than high. For let us suppose that the engines require 3 lb. per horse per hour at 5,000 I. H. P., and 2½ lb. at 10,000 I. H. P. Here the loss is 2,500 lb. per hour at the lower power. If, on the contrary, the position were reversed, then the loss at the high power would be 5,000 lb. per hour, or twice as great. But, again, it must not be forgotten that on a long cruise it might be better to save coal at the low than the high powers—because consumption is not then measured by hours but by the distance run, while in actual warfare the conditions would be often, if not always, reversed.

"Various ways out of the difficulty have been suggested. One is to provide two sets of engines for each screw and to disconnect the forward set when cruising. Another is to shut off the low pressure cylinder, and work the high and intermediate cylinders compound. Another is to shut off the high-pressure cylinder and use the intermediate and low-pressure as a compound engine. Another is to lower the boiler pressure, and still keeping the three cylinders in use alter the cut-off, so that the high pressure cylinder has something like a 90 per cent. admission. All these plans have their advocates. To all considerable objections may be urged. Admiral Melville, it will be seen, favors the use of triple screws. His opinion carries great weight. He has stated his case very fairly and fully; and it will be remembered that when a paper on triple screws was read before the Institution of Naval Architects by Mr. Norton, U. S. N., last year, the criticism was half-hearted. In a private letter which we have seen from Admiral Melville, the following words occur: 'We have had but two triple-screw ships built for our service. The sailor-man does not take kindly to them, and the strongest argument that I have heard made by one of our best captains of the line was that he felt badly enough with his ship in hand with two screws, without having three screws in his head to take care of; which argument, to my mind, is absolutely no objection at all, as it would only be necessary to have the central screw continually going ahead and maneuver his ship with the two wing screws; or, on the other hand, stop his center screw and maneuver with his twin screw, either in action or out of action.' Admiral Melville has so fully set forth his arguments that we need not reproduce them here, even in part.

"Turning now to the policy of our own admiralty, we find that the fundamental idea has been to depend more on a general reduction in the consumption of fuel at all speeds rather than on the production of an engine which shall be specially economical at, say, a cruising speed. There is a popular theory, if we may use the phrase, that high-pressure steam must be more economical than low. We admit this, and still find the game not worth the candle. There are at work now a few merchant steamers with quadruple expansion engines and a boiler pressure of 200 lbs. or a little over, which are said to be very economical in their consumption of coal; but, as we have pointed out, this satisfactory result is only secured because the engines are always worked under the best possible conditions, at all events when the ship has cargo on board. It does not appear that these can obtain in a fighting ship save under exceptional conditions, and in the British navy there are, we are happy to say, no quadruple expansion engines. According to Mr. Goshen (first lord of the admiralty) most of the troubles which have been incurred at sea are due to the excessive pressure which came into use with the Belleville boiler. So far there is no evidence that any economic countervailing advantage has been gained by the innovation. The figures given in Mr. Goshen's memorandum are about as favorable to one type of engines and boilers as to the other; and we entirely fail to find any evidence to prove that high-pressure steam has conferred any benefits at any speeds over steam of 155 lbs. pressure, as heretofore used in the navy. What is the best way of applying power in fighting ships may be taken as still an open question; one about which a great deal remains to be said. That there are objections to the triple screw is certain. As far as we can see, the feature certainly in favor of the first, is that repairs can be effected and adjustments made on the standing engines. The efficiency of the ship can be better maintained than with two screws. Whether a distinct economy in fuel can be secured as well we are not prepared to say. There is every reason to believe that as far as consumption per I. H. P. is concerned, there would be a saving. But the drag of the idle screw must be taken into account; and it has yet to be settled. Hichborn lost no time in getting to the third floor of the state, about which we possess no information whatever based on experience."

## PIG IRON SITUATION.

Mr. Archer Brown of Rogers, Brown & Co., in speaking of the present industrial outlook is quoted as follows on the situation in pig iron:

"As a result of the low prices there has been a large volume of business transacted during the past few days, and there have been more inquiries, but this business has been brought out by the enticing prices. The pig iron producers are slowly reducing their production. We have blown but one of our most important furnaces at Tonawanda, N. Y., for repairs, but it is expected that it will be reopened by Oct. 1. There have been several furnaces closed in Virginia and Pennsylvania with which we have trade relations. This policy will be kept up during the present month and well into September. I think that by the end of this month there will be as many more furnaces blown out as there have been during July. It will take some time for this reduction to make its effect felt on the general market, and patience is the one feature which must be exercised during this period."

Rogers, Brown & Co. have closed contracts during the past few days for the shipment of several thousand tons of pig iron to foreign ports.

## TRADE NOTES.

Economy and reliability of lubrication are required in the modern steam engine. A pamphlet, neatly printed and well illustrated, just issued by the Phenix Metallic Packing Co. of 7 and 9 So. Jefferson street, So. Chicago, deals with this subject in a very interesting manner. It is a brief, compact description and summarized statement of the qualities and characteristics of the Phenix lubricator pump, together with a partial list of its many users.

The American Ship Building Co. has installed the Buffalo feed water heater and purifier (Robert Larmonth, White building, Buffalo), on the following steamers built by them this year: John W. Gates, J. J. Hill, Orlando M. Poe, Harvard, C. R. Van Hise, Isaac L. Ellwood, R. W. E. Bunsen, Lafayette, Cornell, Wm. Edenborn, Princeton and Rensselaer. The purifier has also been installed this year in Buffalo on the steamers Chili, Andrew Carnegie and W. D. Rees.

The great success of the Flushometer, manufactured by the Kenney Co., New York, has brought a large number of imitations into the field. Counsel for the Kenney Co. have advised that these imitations are undoubtedly infringements on the patents under which the Flushometer is manufactured, with the result that suits against several of the infringers will shortly be commenced. Proceedings are also contemplated against manufacturers who are using on their goods names similar to the word Flushometer, the use of which names, the Kenney Co. claims, is an infringement of their trade mark rights and constitutes unfair competition.

An interesting study in methods of publicity and promotion is presented by the progress of the B. F. Sturtevant Co. of Boston, Mass., during the past few years. This company, devoting itself principally to the manufacture of blowers, has gradually evolved many special types designed for specific uses. It has not been deemed sufficient to merely advertise these types, but exhaustive study has been made of the conditions and best methods of application, special treatises have been prepared upon these subjects, purely educational articles regarding them have appeared in the technical press, and special illustrated lectures have been delivered before technical schools and societies. Some of these lectures, devoid of all reference to the B. F. Sturtevant Co., have been published for free distribution with gratifying results. Among recent publications and lectures by Walter B. Snow of the engineering staff, entitled "The Influence of Mechanical Draft Upon the Ultimate Efficiency of Steam Boilers," "Mechanical Ventilation and Heating by a Forced Circulation of Warm Air" and "The Application of Mechanical Draft to Stationery Boilers." Any one of these publications will be sent upon request.

## NEW STEEL STEAMSHIP FOR RED D LINE.

To the Neafie & Levy Ship & Engine Building Co. of Philadelphia has been awarded a contract to build a large twin screw steel steamship for Boulton, Bliss & Dallett, general managers of the Red D line of New York. While the new vessel will not develop high speed, a large cargo capacity being the main requisite, ample accommodations will be provided for a limited number of passengers. When turned over to her owners ten months hence the new vessel will be placed on the sailing schedule between New York and Venezuela by way of La Guayra, Puerto Cabello, Curacao and Maracaibo.

The general dimensions of the new vessel will be: Length over all, 278 ft.; breadth, 37 ft., and depth of hold 19½ ft. The maximum displacement will be 3,000 tons, and the indicated horse power 1,200. Her engines will be of the vertical, triple expansion type. Steam will be generated in Scotch boilers. Besides steam steering gear and windlasses, the ship will have electric installation. There will be two steel masts. The cost will be $250,000.

## NO DRY DOCK AT COLUMBIA RIVER.

The naval board of engineers appointed under the terms of the current naval appropriation bill to examine and report upon the desirability of the location of a dry dock at the mouth of the Columbia river, has reported to the navy department against the project under present conditions. The board is of the opinion that under present conditions the location of a dry dock and the naval station, which would inevitably result from the building of a dock, would not be of sufficient benefit to warrant the expense of its establishment and maintenance. But the board reports that if the bar were removed and the river dredged, the location of a dry dock at the mouth of the Columbia river, capable of accommodating modern vessels of war, would have undoubted advantages. Not being able to report upon the advisability of establishing a dock, the board did not go into the question of a site, but says if it is deemed advisable at some time in the future to locate a dock there, there would be no difficulty apparently in obtaining a suitable site. The board consists of Capt. Glass, Lieut. Andrews and Civil Engineer Salford.

Capt. Gordon Green's new steamboat Cricket will soon be completed at Gallipolis, Ohio, where she is receiving her machinery. She will take the place of the packet Greenwood during the low water season.

## VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of August 15, 1900.

| NAME OF STOCK. | OPEN | HIGH | LOW | CLOSE |
|---|---|---|---|---|
| American Steel & Wire..... .... | 35⅞ | 36 | 35½ | 35½ |
| American Steel & Wire, Pfd..... | 75¼ | 76¼ | 75¼ | 75½ |
| Federal Steel ..... | 35¾ | 35¾ | 35¼ | 35¼ |
| Federal Steel, Pfd..... | 67½ | 67½ | 67 | 67 |
| National Steel ..... | 27 | 27½ | 27 | 27⅜ |
| National Steel, Pfd..... | 85 | 85½ | 85 | 85½ |
| American Tin Plate ..... | 26⅜ | 27¼ | 26⅜ | 26½ |
| American Tin Plate, Pfd..... | 79 | 79½ | 79 | 79¼ |
| American Steel Hoop..... | 20⅝ | 20⅞ | 20⅛ | 20⅛ |
| American Steel Hoop, Pfd..... | 67½ | 67½ | 67 | 67⅜ |
| Republic Iron & Steel ..... | 11¾ | 12⅛ | 11¾ | 12 |
| Republic Iron & Steel, Pfd ..... | 53½ | ..... | ..... | 53½ |

### VICISSITUDES OF THE SHIPPING TRADE.

Here are a couple of illustrations of the vicissitudes of the shipping trade. It must not, however, be inferred tnat to go and do likewise would necessarily produce equally satisfactory results. Years ago a violinist in an orchestra at a foreign port had a strong desire to go into shipping. Having scraped together £4,000 he remitted the amount to a friend in this country, instructing him to expend it in getting a small steamer built and sent out to him. The boat was to be of certain dimensions and accommodation, and was evidently intended for special business. The friend waited on a well-known shipbuilder and placed the matter before him. The builder said he could not construct the steamer for less than £7,000, and when asked by the agent to reduce the dimensions and do the best he could for the £4,000, replied that he could not see his way to that either, as it was clear to him that the vessel was meant for a special trade and that if she fell materially short of the rough specification sent over she would not be suitable for the employment. The friend then proposed that the shipbuilder should undertake the construction of the vessel for £7,000, looking to his principal abroad for the difference of £3,000, assuring the builder that there was not the slightest doubt about his receiving payment, his correspondent being a very honorable man.

After thinking the matter over the shipbuilder fell in with this suggestion, and the vessel was built, sent out, and the balance of cost came to hand in due course. What with extras, outfit and the expenses of the run out, she cost her owner another £1,000, or £8,000 in all. Immediately on her arrival out he chartered her to the government of his country for two years at £1,000 per month clear, that is, he let the boat on those terms to the charterers free of expenditure on his part. At the end of the term the charterers, who found the steamer extremely suitable and serviceable, offered to purchase her, and she was sold to them for £16,000. Thus the owner received, first, for the hire of the boat for two years £24,000, or exactly three times her cost, and at the end of that period, on her sale, £16,000, or exactly twice her cost, or, altogether, at the end of the two years, £40,000 for a vessel costing £8,000—being five times her original cost, or 500 per cent. on his original investment. This throws into the shade all the recent reports in these columns of exceptional trading returns on new ships followed by large further profits on the sale of them; it also leaves far behind the old-time records of vessels wiping off their original cost in between one and two years.

But I have heard of another case which quite cuts out the above. Two small steamers were, many years ago now, built in this country for a firm in Australia, and were duly despatched to their destination. What I have to relate concerns only the smaller of the two steamers. Her size and cost have not been mentioned to me, but as will be seen by the sequel she must have been very small, and probably her cost did not much exceed, if it did exceed, that of the boat referred to above. Some years after the vessel was built two men presented themselves at the office of the builder in this country, and, on being shown into his room the spokesman said: "Sir, we are Australians. You won't know us; but being in this neighborhood we thought we would like to call and see you and tell you a little romance about a small steamer you once built for a firm in the colony." Only a few words more were needed to settle the identity of the craft.

The spokesman then continued: "Well, sir, we bought the little steamer. But, first, I must tell you that gold had been discovered up the river—(a certain river which he named) and that there was a tremendous rush to get to the place. To reach the spot by land was scarcely feasible, the road being through wild country—by which I mean that there was no regular road at all. The way to the place was by the river; but shortly after the rush commenced a curious accident took place. One of the largest steamers employed in taking men to the new gold region touched one of the banks with her stern, swung round and got the other end of herself fast on the opposite bank. She could not be removed, and in a short time she was the means of establishing a sandbank across the central portion of the river. Well, sir, all the steamers engaged in this new traffic were blocked by the stranded steamer, one steamer alone could just get round her bows and carry on the trade —that was our little steamer, the one which you built. The journey was a short one, but under the special circumstances men were willing to pay us £5 a head for the trip, and consequently we saw our way to charge that very profitable rate, and we made a fine thing of the business. How much do you think, sir, we netted in the first year?" The shipbuilder said he could make no guess likely to be correct. "Sir," the Australian said, swelling up with justifiable pride, "we made £90,000 the first year!" I have not heard further details, but should not be surprised if the profits for the 12 months referred to reached 1,000 per cent.—Fairplay.

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Owing to the defective condition of dry dock No. 3 at the New York navy yard it has been found necessary to postpone the preliminary official trial of the battleship Alabama, which had been set for the 20th inst. over the government course off the coast of New England. The big ship is to be docked at New York preparatory to the trial, and it has been found that the dock must undergo certain repairs before it can be used for the purpose. It is said, however, that there will be no great delay in the matter and that the vessel can be tried in time to permit of her presence at Portsmouth, N. H., on the occasion of the big naval demonstration in commemoration of the historic fight between the Kearsarge and the Alabama off Cherbourg, France, during the civil war. It is proposed to have the modern namesakes of those warships at the coming celebration.

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The British battleship Vengeance has seventy-eight auxiliary engines on board, and the British first-class cruiser Terrible has ninety-three auxiliaries. The torpedo boat destroyers of the Mermaid type have eighteen auxiliary engines.

### AMONG THE COAST SHIP BUILDERS.

The United States light-house tender Lilac has been at Bath Iron Works, Bath, Me., since May 21. Capt. Sterling has managed to keep the crew of seventeen men busy during the time the Lilac has been hauled up and as a result the steamer looks almost like new. The Lilac formerly had two boilers. She now has one, 14 ft. in diameter and 13½ ft. in length. The shell is 1 1-16 in. in thickness. It is a three-furnace, Scotch boiler, has 115 pounds working pressure, and the same heating surface as the two which were removed. A new inner bottom has been built under the boiler and fire room and the coal bunkers are now on each side of the boilers instead of forward. A new steering room has been located in the room which was formerly the forward coal bunker. The coal capacity is about the same. The Lilac will haul out on the South Portland marine railway and have her bottom painted, after which she will resume her duties. Her district extends over a route of about 300 miles. It is expected that she will now be able to make about 12 knots.

The Ward Line steamer Morro Castle returned to Cramp's ship yard on Monday from her trial trip. The test was successful throughout, the Morro Castle proving herself to be the fastest passenger ship under the American flag excepting the American liners. The maximum speed of the ship during her run at sea was 18.2 knots, which speed she kept for four consecutive hours. The average speed for 24 hours straight was 18 knots. The Morro Castle will be turned over to the Ward line in two weeks.

The Pacific Coast Steamship Co. has contracted with the Union Iron Works, San Francisco, Cal., for a new steel steamer, to be 270 ft. in length and 40 ft. beam, for the Alaska excursion business. She will be one of the handsomest steamers on the coast, and will be ready in time for next season's business.

The schooner William C. Carnegie was launched from the yard of Percy & Small, Bath, Me., last Saturday. The vessel is 290 ft. in length, 46 ft. 2 in. beam, 22 ft. 4 in. depth of hold and measures 2663 tons. She is owned by J. S. Winslow & Co., Portland, Me. Capt. Mitchell Reed will command her.

A four-masted schooner, the Geneva, building at Rockland, Me., for J. S. Emery & Co., will be launched about Sept. 1, and will hail from Boston. Capt. Bjorkland of the bark Shetland will command her. The same firm expects the four-master Medford will be launched at Bath the same time.

The keel has been laid in Bellingham Bay, Wash., for a new steamer, to be 150 ft. long, and 25 ft. beam. Her engine will be of 1000 H. P. She will run between San Pedro and Catalina island, being the pioneer of a fleet to be built by the Monticello Steamship Co. of San Francisco.

The unusual occurrence of shortening a steamboat has been completed in the yard of the E. J. Codd Co., Baltimore, Md. It is not unusual to have steamers lengthened, but the case of shortening the freight steamer Martha Stevens is probably unique.

The submarine torpedo boat Plunger was hauled out of the water at the Wm. R. Trigg Co.'s Works, Richmond, Va., last Monday, preparatory to changing her motive power. A great deal of work yet remains to be done on the Plunger.

Two new steel tugboats now being completed at the ship yard of the Burlee Dry Dock Co., Port Richmond, S. I., for the Lehigh Valley Ry. Co., will bear the names Genessee and Mahonoy. They are intended for use in New York harbor only.

The battleship Wyoming will be launched at the Union Iron Works on Sept. 8. Gov. Richards and staff, with other state officials, have been invited, and other special invitations to the number of 1,000 will be issued.

The 11,500-ton steamship to be built by the New York Ship Building Co., at Camden, N. J., will be called the Arizonian. She is for the Flint-Dearborn line to San Francisco.

Bealky's ship yard at South Somerset, Mass., was totally destroyed by fire last week. Considerable heavy machinery and a number of expensive tools were ruined.

Torpedo boat Stockton, building at the works of the Wm. R. Trigg Co., Richmond, Va., will be launched Sept. 1.

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A New York dispatch announces that Mr. George J. Gould has sold the steam yacht Atalanta, through Messrs. Gardner & Cox of New York, to the Colombian government for a gunboat. The yacht is at South Brooklyn, but will be taken in hand at once by the representatives of her owners and fitted for the service intended. The Atalanta was built by Messrs. Cramp & Sons of Philadelphia for Jay Gould in 1883, and upon his death became the property of George J. Gould.

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Sealed proposals will be received at the office of the Light-House Engineer, Buffalo, N. Y., until 12 o'clock M., Sept. 17, 1900, and then opened, for constructing a steel frame keepers dwelling and tower with lantern, and fog-signal house, upon crib and concrete foundation in Lake Erie, entrance to Maumee Bay, Ohio. Specifications, forms of proposal and other information may be had on application to this office. Thomas W. Symons, Major, Corps of Engineers, U. S. A.

Aug. 16.

## VESSEL AND INSURANCE AGENTS.

### C. W. ELPHICKE & CO.
**Vessel and Insurance Agents,**

Room 10, No. 6 Sherman St.,

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Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

### ELEVATORS.

Morse, Williams & Co.....Philadelphia.

### ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co.....New York.

### ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Pelton Engineering Co.....Cleveland.
Sprague Electric Co.....New York.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

### ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

### ELECTRIC STEERING GEAR.

Electro-Dynamic Co.....Philadelphia.

### ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.
Wolff & Zwicker Iron Works.....Portland, Ore.

### ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

### ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

### FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

### FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

### FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

### FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

### FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

# BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

**FLUSHOMETERS.**
Kenney, The Co.....New York.

**FURNACES FOR BOILERS.**
Continental Iron Works.....New York.

**FUELING COMPANIES AND COAL DEALERS.**
Castner, Curran & Bullitt (Pocahontas).....
..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.. .....Chicago.

**GAS BUOYS.**
Safety Car Heating & Lighting Co.....New York.

**GAS AND GASOLINE ENGINES.**
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co..... .....Cleveland.
Olds Motor Works.....Detroit.

**GAGES, STEAM AND VACUUM.**
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

**GRAPHITE.**
Dixon Crucible Co., Joseph.....Jersey City, N. J.

**HAMMERS, PNEUMATIC.**
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

**HAMMERS, POWER DROP.**
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

**HAWSERS, WIRE.**
American Steel & Wire Co.....Chicago.

**HEATING APPARATUS.**
Sturtevant Co., B. F.....Boston.

**HOISTS FOR CARGO, ETC.**
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co... .....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co..... .....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co..... .....New York.
Westinghouse Electric & Mnfg. Co.... ...Pittsburg.

**INDICATORS FOR STEAM ENGINES.**
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

**INJECTORS.**
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

**INSURANCE, MARINE.**
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys..... .....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H..... .....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

**IRON ORE AND PIG IRON.**
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

**IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.**
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

**LATHES OF ALL KINDS.**
Niles Tool Works Co.....Hamilton, O.

**LAUNCHES—NAPHTHA, ELECTRIC.**
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

**LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.**
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

**LIGHTS, SIDE AND SIGNAL.**
Page Bros. & Co.....Boston.

**LUBRICATING PUMPS.**
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

**MACHINE TOOLS.**
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

**MACHINE TOOLS (WOOD WORKING).**
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

**MATTRESSES, CUSHIONS, BEDDING.**
Fogg, M. W.....New York.

**METALLIC PACKING.**
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

**METALS FOR BEARINGS.**
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

**METAL POLISH.**
Bertram's Oil Polish Co.....Boston, Mass.

**MILLING MACHINES OF ALL KINDS.**
Niles Tool Works Co.....Hamilton, O.

**NAUTICAL INSTRUMENTS.**
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

**NAVAL ARCHITECTS.**
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

**NICKEL STEEL FORGINGS.**
Bethlehem Steel Co.....So. Bethlehem, Pa.

**OAKUM.**
Stratford Oakum Co., Geo.....Jersey City, N. J.

**OILS AND LUBRICANTS.**
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

**PACKING.**
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

**PAINTS.**
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

**PAINTING MACHINES, PNEUMATIC.**
Chicago Pneumatic Tool Co.....Chicago.

**PATENT ATTORNEYS.**
Thurston & Bates.....Cleveland.

**PATTERN SHOP MACHINERY.**
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A..... .....So. Boston.

**PIPE, WROUGHT IRON.**
Bourne-Fuller Co.....Cleveland.

**PLANERS OF ALL KINDS.**
Niles Tool Works Co.....Hamilton, O.

**PLANING MILL MACHINERY.**
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

**PLUMBING, MARINE.**
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

**PNEUMATIC TOOLS.**
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co..... .....Chicago.

**POLISH FOR METALS.**
Bertram's Oil Polish Co.....Boston, Mass.

**PROPELLER WHEELS.**
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B..... .....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

**PROJECTORS, ELECTRIC.**
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co..... .....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

**PUMPS FOR VARIOUS PURPOSES.**
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works.....
.....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

**PUNCHES, RIVETERS, SHEARS.**
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

**REGISTER FOR CLASSIFICATION OF VESSELS.**
Great Lakes Register.....Cleveland.

**RELEASING HOOKS FOR DETACHING BOATS.**
Standard Aut. Releasing Hook Co.....New York.

**RIVETS, STEEL, FOR SHIPS AND BOILERS.**
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

**RIGGING ROPE (WIRE).**
American Steel & Wire Co.....Chicago.

**RUBBER INSULATED WIRES.**
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

**SAFETY VALVES.**
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

**SAIL MAKERS.**
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

**SALVAGE COMPANIES.**
See wrecking companies.

**SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.**
International Correspondence Schools.....Scranton, Pa.

**SCREW MACHINES.**
Niles Tool Works Co.....Hamilton, O.

**SEARCH LIGHTS.**
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

**SEPARATORS, (CENTRIFUGAL).**
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

**SHAPERS.**
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

**SHEARS.**
See punches, riveters and shears.

**SHIP AND BOILER PLATES AND SHAPES.**
Bourne-Fuller Co.....Cleveland.

**SHIP BUILDERS.**
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co..... .....Chicago.
Wolff & Zwicker Iron Works.....Portland, Ore.

**SHIP CHANDLERS.**
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co..... .....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

**SPARS—LARGE SIZES,**
Moran Bros. Co.....Seattle, Wash.

**STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.**
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

**STEAM VESSEL FOR SALE.**
Holmes, Samuel.....New York.

**STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.**
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

# BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

**STEAMSHIP LINES, PASS. AND FREIGHT.**

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

**STEEL SHAFTS, SOLID OR HOLLOW.**

Bethlehem Steel Co.....So. Bethlehem, Pa.

**STEERING APPARATUS.**

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

**STOCKS, BONDS, SECURITIES.**

Wright, Herbert & Co.....Cleveland.

**STOCKLESS ANCHORS.**

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

**STRUCTURES OF STEEL, BUILDERS OF.**

American Bridge Co.....New York.

**SURVEYORS, MARINE.**

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

**TELEGRAPH—DECK AND ENGINE ROOM.**

Cory, Chas. & Son.....New York.

**TESTS OF MATERIAL.**

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

**THERMOMETERS FOR MECHANICAL PURPOSES.**

Helios-Upton Co.....Peabody, Mass.

**TIMBER—LARGE PIECES.**

Moran Bros. Co.....Seattle, Wash.

**TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.**

Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

**TOOLS, WOOD WORKING.**

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

**TRUCKS.**

Boston & Lockport Block Co.....Boston, Mass.

**TOWING MACHINES.**

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

**TOWING COMPANIES.**

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

**TUBING FOR BOILERS.**

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

**TUBES, SEAMLESS DRAWN, BRASS AND COPPER.**

Hungerford Brass & Copper Co., U. T.....New York.

**VALVES, STEAM SPECIALTIES, ETC.**

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

**VARNISH MAKERS, COLOR GRINDERS, ETC.**

Smith, Edward & Co.....New York.

**VARNISH PAINT.**

Mair, John & Son.....Philadelphia.

**VESSEL AND FREIGHT AGENTS.**

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

**VENTILATING APPARATUS FOR SHIPS.**

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

**WIRE ROPE AND WIRE ROPE FITTINGS.**

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

**WHISTLES, STEAM.**

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

**WINDLASSES.**

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

**WINCHES.**

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

**WOOD WORKING MACHINERY.**

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

**WORM GEARING.**

Morse, Williams & Co.....Philadelphia.

**WRECKING AND SALVAGE COMPANIES.**

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

**YACHT SAILS, FITTINGS, HARDWARE, ETC.**

Wilson & Silsby.....Boston.

**YACHT AND BOAT BUILDERS.**

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

**YAWLS.**

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

# ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

## WANTED FOR SALE, FOR CHARTER, Etc.

**Space under this heading 25 cents a line, each insertion, for three insertions or less. Special rates for periods of more than three insertions.**

—A BARGAIN—FOR SALE—Three 125 H. P. each, Roberts Safety Boilers. 250 working pressure. New. Never been used. Will sell singly or all together. Jas. Beggs & Co., 9 Dey Street, New York. Aug. 23.

—FOR SALE—Barge Manitowoc, 210 by 29 by 13 feet. Capacity 650 M lumber or 1,000 tons coal. John J. Boland, 202 Main street, Buffalo, N. Y. d

—FOR SALE—Good tug, six years old. Engines 18x20. Boiler allowed 130 pounds steam pressure. Address Box 284, Ashland, Wis. Aug. 16

—FOR SALE—Side-wheel steamer John F. Lincoln, with all equipment, including electric light plant. May be inspected at Cape Girardeau, Mo. For sale, also, very cheap, horizontal boiler 24 feet by 47 inches, with ten 6-inch tubes, and allowed 160 pounds of steam; $150 will buy a complete set of tug machinery—engine 12 1-16x18, with 4-inch shaft, stuffing box, journal bearings, and a 4½-foot wheel. Address Linehan Railway Transfer Co., Dubuque, Ia. d

—FOR SALE—Second-hand tug of 7.47 tons. Compound engine. Complete for business. Will be sold at a bargain. Address ENG, Marine Review, Office Marine Review Pub. Co., Cleveland, O. d

—WANTED—Naphtha launch suitable for delivering goods in harbor. Tonnage about 5 or 6 gross. Will pay cash for new boat or for second-hand if in good order. Ship Chandler, Marine Review Pub. Co., Cleveland. O. d

—FOR SALE—Marine boiler of 6½ by 12 feet. Allowed 110 pounds steam. Never been cut. Also breeching smokestack and grates. E. E. Koch, Sandusky, O. Sept. 21.

—FOR SALE—Scotch marine water-back boiler; 7 feet diameter, 11 feet long; dome 30x30 inches; furnace 40 inches diameter; 69 3-inch tubes, 8 feet 6 inches long. Built under government inspection and just completed. Price $2,000. F. O. B. cars Minneapolis. Address Nicollect Island Boiler Works, Minneapolis, Minn. tf

# MARINE REVIEW

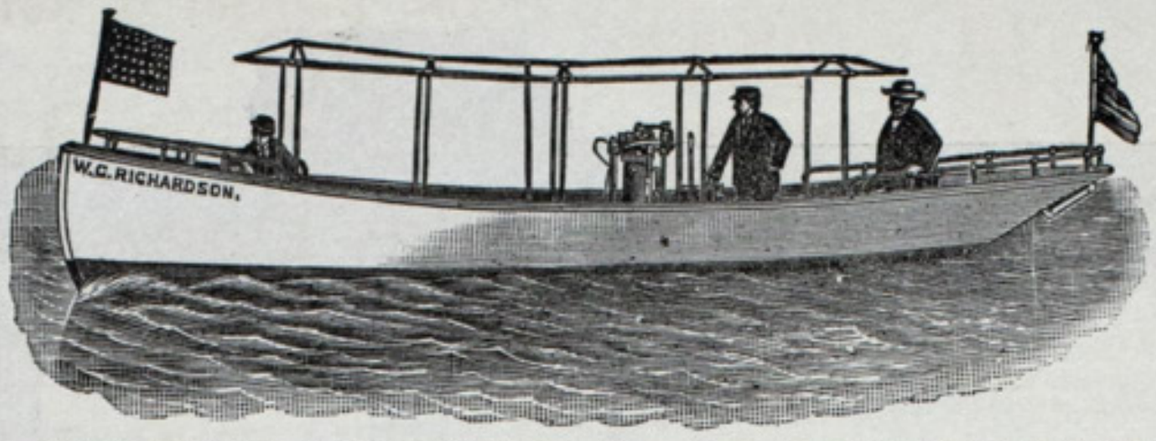
VOL. XXII. CLEVELAND, O., AUGUST 16, 1900. No. 7.

# The Wootters Gas Engine.

Especially adapted for launches and ferry boats. Fitted with friction clutch or reversible shaft.

These engines are giving entire satisfaction in the pleasure yacht W. C. Richardson and the delivery launch Lotta.

Prices and particulars furnished on application.




NAPHTHA LAUNCH W. C. RICHARDSON,(Engine 8 horse power—speed 8 miles an hour.)

Suitable for all purposes requiring from 1 to 200 horse-power, with the lowest possible expenditure.

Engines of the stationary type built for every purpose where a reliable and efficient power is required.

BUILT BY THE McMYLER MFG. CO., GAS ENGINE DEPARTMENT, 180 Columbus St., CLEVELAND, O.

## NEVERSINK CORK JACKET AND LIFE BELT.

Warranted 24 pounds. Buoyancy and full Weight of Cork, as required by U. S. Inspectors.

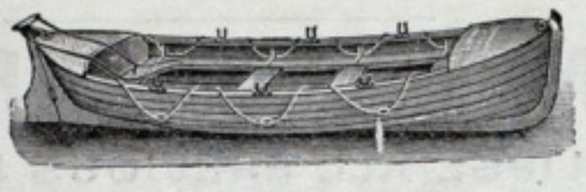
**Consolidated Cork Life Preservers. Ring Buoys and Fenders.**

SAFEST, CHEAPEST.

Approved and adopted by U. S. Board of Supervising Inspectors. Also adopted by the principal Ocean, Lake and River Steamer Lines as the only Reliable Life Preserver. Awarded four Medals by World's Columbian Exposition.

Send for Illustrated Catalogue.

Metallic and Wooden Life Boats.



**Metallic Life Rafts. Marine Drags.**

Manufacturers of Woolsey's Patent Life Buoy—the lightest, cheapest and most compact Life Raft known.

**DAVID KAHNWEILER'S SONS**
437 Pearl Street, NEW YORK CITY.

## WM. R. TRIGG COMPANY,

SHIP BUILDERS, RICHMOND, VA.

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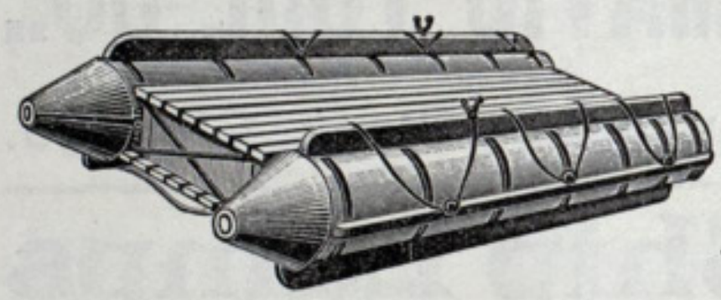

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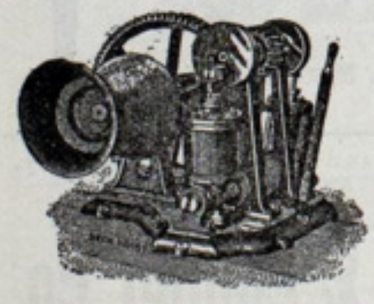

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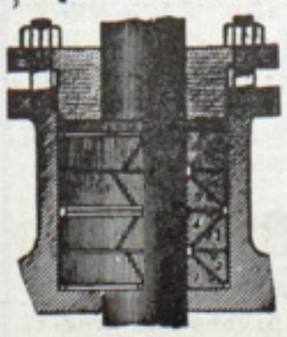

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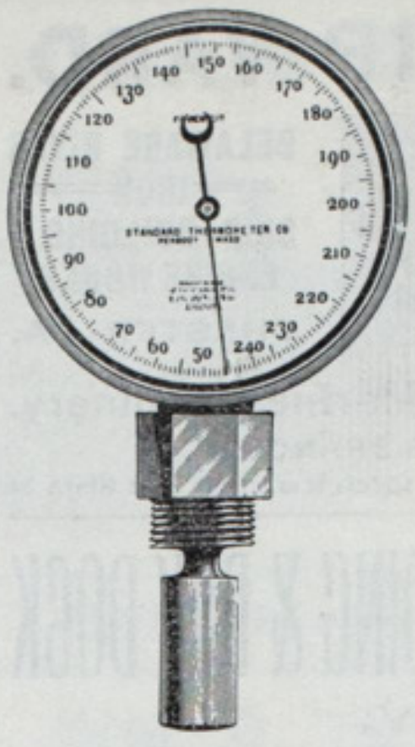

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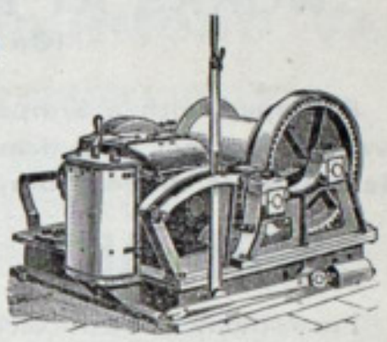

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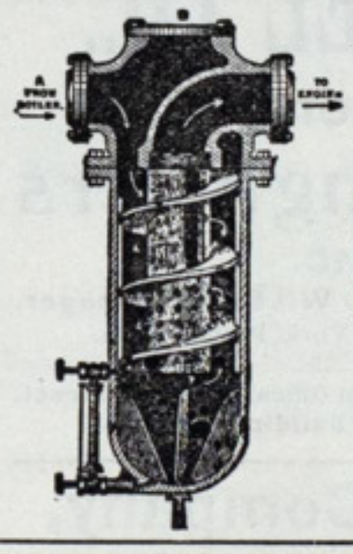

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